REMARKS/ARGUMENTS

Claims 1-33 are pending in this application. Claims 1, 5, 6, 10, 20 and 30 have been amended. Claims 34-38 are added. No new matter has been introduced thereby.

In the Office Action mailed 04/11/2006, the Examiner objected to the information disclosure statement filed on May 24, 2004 as it failed to comply with the provisions of 37 C.F.R. 1.97, 1.98, and MPEP §609. A copy of the information disclosure statement, in accordance with the above provisions, and certification requirement for statements under 37 C.F.R. 1.97(e) is hereby enclosed. Accordingly, the Examiner's objections are now moot.

Claims 1, 5, 10, 13-18, and 30-34 are rejected under 35 U.S.C. §102(e) as being anticipated by Milic-Frayling et al. (US 2006/0059138). Claims 2-4 and 11-12 are rejected under 35 U.S.C. §103(a) as being unpatentable over Milic-Frayling et al. Claims 6-9 and 19-20 were rejected under 35 U.S.C. §103(a) as being unpatentable over Milic-Frayling in view of "Creating a CD-ROM: Overview of the product field. (CD-ROM authoring and data retrieval software packages; includes company directory and related article on resources for doing research)", Buyers Guide by Bernard Banet, Seybold Report on Desktop Publishing , v7, n6, February 1, 1993. As noted, the cited references, alone or in combination, do not disclose or suggest the present method of identifying entities having expertise in one or more subjects in health care fields as recited in claim 1, as amended. The method includes querying a database for documents relevant to a subject, and calculating a first score for each relevant document. The method then determines entities affiliated with one or more relevant documents and calculates a second score for each entity based on the one or more first scores of the one or more relevant documents affiliated with the entity. The method includes ranking expertise of the entities based on the respective second scores of the entities.

In contrast, the conventional method provided by Milic-Frayling et al. is merely a conventional search. That is, Milic-Frayling, et al. merely relate to an "information highlight facility" for searched documents, i.e., conventional search. Additionally, Milic-Frayling et al.

may even "re-rank" a document based on a model of a user's interest (paragraph 0041). Such model is derived by monitoring the user's action and information provided by the task the user is performing, e.g., working on a project, sending an email, etc (paragraph 0042) and not the method of identifying entities having expertise in one or more subjects in health care fields in the manner claimed, as recited in claim 1, as amended. As merely an example, the entity can include a hospital, doctor, or others according to the present invention. Additionally, a focus of Milic-Frayling et al on documents is consistent their aim to assist a user in "searching, browsing, and reading documents" (paragraph 0012). Similarly, their conclusion states that their invention can "assist the user in evaluating the relevance of documents" (paragraph 0096), which is not related to the present invention. Accordingly, claim 1 is patentable over Milic Frayling et al.

The Examiner also cited Banet combined with Milic-Frayling et al to reject claims 6-9, and 19-20. As noted, the cited references, alone or in combination also fail disclose or suggest the present method of identifying entities having expertise in one or more subjects in the manner claimed. Banet described features of CD-ROM retrieval software using fields such as "author", "date", "title", "subject" as keywords to search for a document. In contrast, the method according to present invention identifies entities having expertise in one or more subjects in health care fields as recited in claim 1, as amended. The entities recited in claim 6 and claim 19 include an author or one or more institution from which the document emanated. Accordingly the entities recited in claim 1 are an output of the query rather than a keyword used for searching. Accordingly, claim 1 is patentable over the cited references, alone or in combination. Corresponding dependent claims 2-29 and additional features cited therein, should also be allowed based on at least the same reasons and others.

The National Library of Medicine Internet homepage (www.webarchive.com from the year 2000), cited for the purpose of allegedly showing that Medlars is one of the medical databases does not cure the aforementioned deficiencies of Milic-Frayling et al. or Banet.. Accordingly, claim 1 is patentable over the cited references. Claims 2-29 and additional features cited therein, should also be allowed based on at least the same reasons and others.

Claim 30, which disclosed a system for the method of identifying entities having expertise in one or more subjects should also be allowed based on the rationale as discussed for claim1, and others. Accordingly, claim 30 is also patentable.

Applicant added new claims 34-38. No new matter has been introduced thereby. Applicant asserts that newly added claim 34 is patentable over cited references. As shown, claim 34 recites a method of assessing expertise associated with an entity in a subject in health care fields. As an example, the subject can be coronary bypass, nausea, stroke, and others. The method includes querying a database (e.g., Pubmed) for documents relevant to the subject and determining a first set of entities associated with the relevant documents. Again, as an example, the entities could be authors, institutions, and others. The method also includes calculating a score (e.g., quantification, numerical estimate) for each entity in the first set of entities based on the number of relevant documents associated with each entity. As an example, the method initially populates a database with, for example, the entity such as the institution and/or the author with associated scores or scores. The method includes populating a second database to include each of the entities in the first set of entities and the score associated with each of the entities in the first set of entities.

Now that the database has been populated, a user can, for example set up a query to determine a desired institution and/or author or the like based upon the subject, which can coronary bypass or stroke, as an example. As provided by claim 34, the method includes receiving a query related to an entity. The method includes determining a second set of entities associated with the entity related to the query. The method includes retrieving from the second database the score associated with each entity in the second set of entities. The method includes representing to a user the scores of the entities in the second set of entities or a ranking of the entities in the second set of entities based on the scores of the entities in the second set of entities. The score of an entity is indicative of the expertise in the subject associated with the entity. Such features are not suggested or disclosed in cited references. Accordingly, claim 34 should be allowed. Dependent claims 35-38 are also allowable. Accordingly, all claims now pending in this application should be allowed for these reasons and others.

Conclusion

Applicant believes that all claims in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,

Richard T. Ogawa
Reg. No. 37,692

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Fax: 415-576-0300
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Our list of doctors contains the names of physicians who were mentioned multiple times by other physicians in their communities. The names appear associated with the specialty category chosen by the surveyed physician.

Here is the list of the specialty categories:

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- Family Practice
- Gastroenterology
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- Infectious Disease
- Infertility
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- In which specialty category the doctor was mentioned
- Where and when the doctor graduated from medical school
- In which fields the doctor is board certified
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--Hope Rubin, MD, PhD Johns Hopkins University School of Medicine

"If health care consumers are to make sound choices, they need good information. That's exactly what the *Guide to Top Doctors* provides"
--Paul Torrens, MD, MPH Professor, UCLA School of Public Health

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Consumers' Guide to Top Doctors

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Geographic Areas

The Top Doctors database include doctors in more than fifty of the nation's largest Metropolitan Statistical Areas (MSAs). In some cases, what we have referred to as a single area includes several MSAs – for example, the Miami, Ft. Lauderdale, and West Palm Beach MSAs are all included in what we refer to as "South Florida." The areas are generally defined by one or more counties, though some of the doctors listed in an area might practice outside county boundaries.

Here are the areas you may choose from, often accompanied by a more complete explanation of what defines them then appears in the selection window of the search page.

Arizona
Phoenix Area (Including Maricopa County)

California
Los Angeles Area (Including Los Angeles and Orange Counties)
Riverside and San Bernardino Counties Area
Sacramento Area (Including Sacramento County)
San Diego Area (Including San Diego County)
San Francisco Bay Area (Including Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, and Solano Counties)

Colorado
Denver Area (Including Adams, Arapahoe, Denver, and Jefferson Counties)

Connecticut
Fairfield and New Haven Counties Area

District of Columbia
Washington, DC Area (Including the District of Columbia, Alexandria City, and Arlington, Fairfax, Loudoun, Prince William, Anne Arundel, Howard, Montgomery, and Prince George's Counties)

Florida
Charlotte, Lee, and Collier Counties Area
Pinellas, Hillsborough, Polk, Manatee, and Sarasota Counties Area
South Florida (Including Broward, Dade, Monroe, and Palm Beach Counties)
Volusia, Seminole, Orange, and Brevard Counties Area

Georgia
Greater Atlanta Area (Including Cobb, Cherokee, Clayton, DeKalb, Douglas, Fayette, Fulton, Gwinnett, Henry, and Rockdale Counties)

Illinois
Greater Chicago Area (Including Cook, DuPage, and Lake Counties)

Indiana
Indianapolis Area (Including Marion County)

Kansas
See Missouri - Kansas City Area

Louisiana
New Orleans Area (Including Orleans Parish)

Maryland
Baltimore Area (Including City and County of Baltimore)
See also District of Columbia - Washington, DC Area

Massachusetts
Boston Area (Including Essex, Middlesex, Norfolk, Plymouth, and Suffolk Counties)

Michigan
Greater Detroit and Washtenaw County Area (Including Macomb, Oakland, Washtenaw, and Wayne Counties)

Minnesota
Twin Cities Area (Including Anoka, Hennepin, and Ramsey Counties)

Missouri
Kansas City Area (Including Jackson, Johnson, and Wyandotte Counties)
St. Louis Area (Including City and County of St. Louis)

New Jersey
Northern New Jersey (Including Bergen, Essex, Hudson, Middlesex, Morris, Passaic, Somerset, and Union Counties)
See also New York - New York Metropolitan Area
See also Pennsylvania - Greater Philadelphia Area

New York
Buffalo Area (Including Erie County)
New York Metropolitan Area (Including New York City, Long Island, and Rockland and Westchester Counties)
Rochester Area (Including Monroe County)
See also Connecticut - Fairfield and New Haven Counties
See also New Jersey - Northern New Jersey

North Carolina
Charlotte Area (Including Mecklenburg County)
Forsyth and Guilford Counties Area
Research Triangle Area (Including Durham, Orange, and Wake Counties)

Ohio
Cincinnati Area (Including Hamilton County)
Cleveland Area (Including Cuyahoga County)
Columbus Area (Including Franklin County)

Oregon
Portland Area (Including Clackamas, Multnomah, and Washington Counties)

Pennsylvania
Greater Philadelphia Area (Including Bucks, Chester, Delaware, Montgomery, and Philadelphia Counties and New Jersey Counties of Burlington, Camden, and Gloucester)
Pittsburgh Area (Including Allegheny County)

Tennessee
Nashville Area (Including Davidson County)

Texas
Austin Area (Including Travis County)
Dallas/Ft. Worth Area (Including Dallas and Tarrant Counties)
Houston Area (Including Harris County)
San Antonio Area (Including Bexar County)

Utah
Salt Lake City Area (Including Salt Lake County)

Virginia
Norfolk Area (Including City of Norfolk)
See also District of Columbia - Washington, DC Area

Washington
Seattle Area (Including King and Snohomish Counties)

Wisconsin
Milwaukee Area (Including Milwaukee County)

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- Why We Charge
- Wrong Ways to Choose a Doctor

Why We Charge

We give you a lot more than just a name.

Behind every referral we make there is a long history and a lot of effort. We have more than 12 people working full time surveying doctors – asking them the questions that you would ask – to make sure that every name we give out represents the very best the medical profession has to offer. No other referral service does that.

We don't take fees from doctors.

Other referral services take money from doctors to be listed. We don't. Hospitals offer referral services that are nothing more than advertisements for their staff doctors. Some referral services take money from hospitals in return for listing their doctors. HMOs and other managed-care organizations offer referrals to the doctors where they have negotiated the lowest prices. Before you take a free referral, ask yourself: Can I trust this referral? Are they trying to help me, or somebody else?

We believe that people who care about better information are willing to pay for it.

We stand behind our referrals.

Of course, we can't guarantee a successful outcome to your medical problem – no one can do that. But we do guarantee you that the doctors we recommend are the very best available. Don't underestimate the value of knowing that your medical problem is in the best hands.

Before accepting a free referral, compare the $25 cost of a Best Doctors® referral to the cost of making a medical mistake.

Checking Your Doctor's Records

Wrong Way to Choose a Doctor

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FAQ

1. How do you find the Best Doctors?

We don't. Our Doctors do. Because we believe if you want to find the very best doctors practicing today, you start by asking doctors themselves who they trust. That's why all of our doctor surveys begin with the question, "Who would you go to, if you or a loved one needed medical care in your specialty?" We pour through almost two million evaluations and review as many as several hundred pertaining to a single doctor. Only those doctors rated the best by other doctors make our list. But we don't stop there. Those doctors must pass not only review by their peers, but our own, which includes a check for licensing and certification requirements. A Best Doctor must then go through regular evaluations in order to stay a Best Doctor. Our methodology has set the industry standard since we invented it in 1992.

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2. How do you know these are truly the Best?

Because the nominations are anonymous, so doctors know their answers are strictly confidential. Because we gather information on doctors from across the nation, and from across the globe. Because our system of review even includes a method for catching and correcting bias, for or against any particular physician or group of physicians. Because the doctors named Best Doctors are keenly interested in identifying only their very best colleagues for inclusion. Because no one can buy or influence our process. We are the most trusted referral service operating today, because we are the most independent. Because we believe in the power of the best medicine and your right to have it.

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3. But aren't all doctors pretty much the same?

No! No one believes for a moment that all teachers are the same, or that all hairdressers are the same, or all mechanics. Yet we do tend to say that about one of the most important professionals we'll all deal with our doctors. Partly that's because the medical

profession has taught us to believe that, in order to encourage people's faith in their own doctors. Partly, it's because we may be eager to believe the nearest, most convenient, or friendliest doctor is probably "good enough". But the hard truth is that some doctors are better than others are. There are good ones, bad ones, indifferent ones, and then there are simply the Best. What Best Doctors does is help you avoid the guesswork, the worry, and the sheer difficulty involved in figuring out the differences.

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5. Will I find a Best Doctor in my home town?

You might. You might have to find one in the next town over. Other referral services might offer you listings of every doctor in every hospital or practice across the country. Ours are the Best. And when you limit yourself to the best, you don't include everyone. That's why only 4% of the Doctors in the United States are identified as a Best Doctor. But rest assured, we don't focus on where a physician is located, but HOW other top doctors within the profession regard that physician's competence, stature and professional abilities.

Back to top

6. Some doctor-referrals are free. Why isn't yours?

Because we work for you. Other referral services (and we won't name any names) simply refer you to the doctors who pay to get on the list. Or they send you to the doctors individual hospitals want you to see. We earn your trust by remaining completely independent. No doctor can pay us to get on the list. No hospital can refer any doctors to us or otherwise influence our selections. We've worked hard to design fees and services to accommodate every need.

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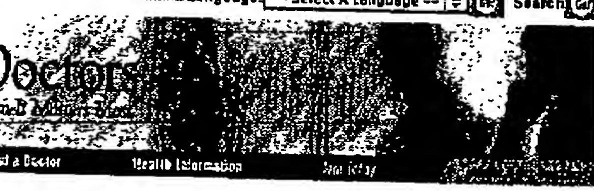

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Methodology

BestDoctors' database of physicians is based on an exhaustive, annual peer-review-based evaluation of the medical profession in which we contact about 30,000 doctors who have been identified in previous surveys as "the best" in their specialties and ask them: "If you or a loved one needed a doctor in your specialty, and you could not treat them yourself, to whom would you refer them?" Even though we use extensive proprietary polling and balloting software on an exhaustive scale, our survey is designed to mimic the informal, peer-to-peer referral process that doctors themselves use to determine the appropriate specialists for individual cases. The difference is that we bring together the insights and experience of tens of thousands of leading specialists and cover over 400 subspecialties of medicine.

Every doctor contacted is given the opportunity both to comment (confidentially) on the other doctors listed in his or her specialty, and to make additional nominations. As new names are added to the pool, each undergoes the same rigorous peer-evaluation process.

The result is a constant refinement of both the voting pool and the nominee pool. Each time a survey is conducted, the list is sifted, refined, and improved, resulting in better representation and more solid consensus. The broadness and depth of the voting pool help eliminate the biases and cronyism that often mar smaller-scale surveys. Finally, in-depth surveying of this type allows Best Doctors to develop detailed profiles of each of the doctors in its database (e.g. hospital affiliations, in-office language skills, special areas of research and/or experience).

Our recent survey of the medical profession involved more than 1 million individual evaluations.

> BestDoctors employs a combination of high-technology surveying methods and person-to-person phone interviews which permit more detailed questions regarding a physician's practice and encourage more open and candid responses.
>
> Doctors who are nominated because of their membership in an informal "referral loop" are subjected to the unbiased votes of scores of doctors not in the loop.
>
> Because all voting is strictly confidential, voters are not subject to the institutional, professional, or community pressures that often influence individual referrals.
>
> We are completely independent. Doctors are not asked for and do not ever pay any fees for inclusion as a Best Doctor. Doctors are not notified of their inclusion until after the survey process is completed.
>
> Every one of the physicians included in Best Doctors Best DocFinder are certified or subcertified through the American Board of Medical Specialties.

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Best Doctors® tools:

- Health Protection Membership Now Best Doctors offers unique services that will help answer your medical and treatment questions, and assist you in accessing the medical expertise you need including ***immediate access to our award-winning referral tool - Best DocFinder***™ With a Best Doctors Health Protection Membership Card, you and your family will always have available the best medical expertise when you need it most - - for less than a dime a day.
- AcuMatch™ is a highly personalized service designed for serious, complex or rare medical problems. A trained nurse will help assess your individual medical needs, identify the best medical care available to meet those needs and determine the doctors' availability.

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Health Protection Membership	Internet and US Mail	41 specialties Entire US Search by State or Zip Code	Immediate for Best DocFinder 10 days for Card	Access Best DocFinder Pharmacy Discounts Expert Consultation * AcuMatch *	$35 per year	Continue
AcuMatch™	Nurses work with patient / patient representative to determine specific case needs	No limitations Entire US Canada Europe, Asia Latin America Search by diagnosis	Average of 5 days	Three physician's name Physician's specialty, subspecialty, and subsubspecialty Physician's Bio Availability confirmed No confirmation of insurance participation	$975	Continue

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Picking the top centers

Reputation, outcomes, and technology all count

By Avery Comarow

These days, even average hometown hospitals offer sophisticated medical care. Diseased arteries are bypassed, organs repaired through small openings in the body, and advanced tests performed. But the institutions cited in the 12th annual edition of "America's Best Hospitals" provide a degree of specialized care few community hospitals can match. This expertise is worth seeking out when quality of life, or life itself, is threatened–say by virulent cancer, intractable pain, or worsening asthma in a child.

U.S. News has identified exceptionally capable medical centers since 1990. This year, we sifted data from 6,118 hospitals to arrive at 168 centers in 17 specialties. These hospitals first had to belong to the Council of Teaching Hospitals, be affiliated with a medical school, or have at least nine technology services from a prescribed list of 17. That narrowed the field to 1,876 hospitals.

Eligibility for ranking in 13 of the 17 specialties then depended on performing a certain number of specific procedures during the past three years for which data are available, or on being identified by at least one physician in *U.S. News* surveys during the past three years. Hospitals that met these requirements received a score, or U.S. News index, that combined reputation, mortality, and a group of other factors related to patient care, such as nursing and technology. The 50 hospitals with the highest scores in each of the 13 specialties appear in this issue.

The four other specialties (eyes, pediatrics, psychiatry, and rehabilitation) had no eligibility requirement. Ranking was determined by reputation alone, because mortality data are unavailable in pediatrics and irrelevant in the other specialties.

The methodology for "America's Best Hospitals" was created in 1993 by the National Opinion Research Center at the University of Chicago, which has revised and carried it out since. The current rankings were assembled by Colm O'Muircheartaigh, Diana Jergovic, Whitney Moore, and Asma Ali. Details of the three parts of the U.S. News index include:

- **Reputation.** Each year *U.S. News* asks 150 board-certified physicians at random in each specialty–2,550 in all–to identify up to five hospitals they consider tops in their specialty, regardless of cost or location. The reputational score shows the percentage of the doctors surveyed over the past three years who chose a hospital.
- **Mortality.** The figure shown is a ratio that compares actual deaths of Medicare patients with the number expected; higher than 1.00 is worse than expected and less than 1.00 is better. Solucient Inc., an Evanston, Ill., supplier of healthcare data, calculated the ratios, adjusting for severity by using a 3M Health Information Systems program, All Patient Refined Diagnosis Related Group.
- **Other factors.** Most of the remaining information comes from annual surveys of member institutions by the American Hospital Association.

The methodology is always under review. This year the lists of medical procedures used in figuring patient volume and mortality in the heart and orthopedics specialties were revised. If you ever need to consult these rankings, you deserve the best chance of receiving the best care.

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43 New Scotland Avenue
Albany, NY 12208
Ranked: 34 in Urology

Sunnyview Hospital and Rehabilitation Center
1270 Belmont Avenue
Schenectady, NY 12308
Ranked: 38 in Rheumatology

ALLENTOWN-BETHLEHEM-EASTON, PA

Lehigh Valley Hospital
Cedar Crest Blvd & I-78
Allentown, PA 18103
Ranked: 40 in Hormonal Disorders ; 44 in Urology

St. Luke's Hospital
801 Ostrum Street
Bethlehem, PA 18015
Ranked: 38 in Heart

ANN ARBOR, MI

University of Michigan Medical Center
300 North Ingalls
Ann Arbor, MI 48109
Ranked: 22 in Pediatrics ; 11 in Cancer ; 26 in Heart ; 10 in Hormonal Disorders ; 14 in Digestive Disorders ; 10 in Geriatrics ; 14 in Gynecology ; 11 in Kidney Disease ; 14 in Neurology ; 11 in Orthopedics ; 5 in Ear, Nose, and Throat ; 14 in Psychiatry ; 12 in Pulmonary disease ; 11 in Rehabilitation ; 12 in Rheumatology ; 14 in Urology

ATLANTA, GA

Emory University Hospital
1364 Clifton Road NE
Atlanta, GA 30322
Ranked: 9 in Heart ; 40 in Gynecology ; 18 in Kidney Disease ; 9 in Ophthalmology ; 41 in Urology

Shepherd Center
2020 Peachtree Road NW
Atlanta, GA 30309
Ranked: 18 in Rehabilitation

AUGUSTA-AIKEN, GA-SC

Medical College of Georgia Hospital and Clinic
1120 15th Street
Augusta, GA 30912
Ranked: 45 in Hormonal Disorders

BALTIMORE, MD

Francis Scott Key Medical Center
4940 Eastern Avenue
Baltimore, MD 21224
Ranked: 29 in Geriatrics

Greater Baltimore Medical Center
6701 North Charles Street
Baltimore, MD 21204
Ranked: 41 in Cancer ; 45 in Digestive Disorders ; 49 in Gynecology

Johns Hopkins Hospital
600 North Wolfe Street
Baltimore, MD 21287
Ranked: 3 in Cancer ; 4 in Heart ; 3 in Hormonal Disorders ; 2 in Digestive Disorders ; 2 in Geriatrics ; 1 in Gynecology ; 6 in Kidney Disease ; 3 in Neurology ; 4 in Orthopedics ; 1 in Ear, Nose, and Throat ; 3 in Pediatrics ; 5 in Psychiatry ; 3 in Pulmonary disease ; 15 in Rehabilitation ; 2 in Rheumatology ; 1 in Urology ; 1 in Ophthalmology

Sheppard and Enoch Pratt Hospital
6501 North Charles Street
Baltimore, MD 21285
Ranked: 12 in Psychiatry

Sinai Hospital of Baltimore
2401 West Belvedere Avenue
Baltimore, MD 21215
Ranked: 41 in Heart

University of Maryland Medical System
22 South Greene Street
Baltimore, MD 21201
Ranked: 33 in Hormonal Disorders ; 45 in Kidney Disease ; 41 in Rheumatology ; 46 in Urology

BIRMINGHAM, AL

University of Alabama Hospital at Birmingham
619 South 19th Street
Birmingham, AL 35233
Ranked: 28 in Cancer ; 13 in Heart ; 27 in Hormonal Disorders ; 26 in Gynecology ; 20 in Kidney Disease ; 24 in Orthopedics ; 42 in Pulmonary disease ; 8 in Rheumatology

BOSTON, MA

Beth Israel Deaconess Medical Center
330 Brookline Avenue
Boston, MA 2215
Ranked: 27 in Cancer ; 10 in Heart ; 5 in Hormonal Disorders ; 19 in Digestive Disorders ; 11 in Geriatrics ; 42 in Gynecology ; 21 in Kidney Disease ; 43 in Neurology ; 37 in Orthopedics ; 31 in Rheumatology

Boston Medical Center
One Boston Medical Ctr Place
Boston, MA 2118
Ranked: 22 in Heart ; 28 in Geriatrics ; 34 in Kidney Disease ; 35 in Neurology ; 14 in Pulmonary disease ; 37 in Rheumatology

Brigham and Women's Hospital
75 Francis Street
Boston, MA 2115
Ranked: 18 in Cancer ; 5 in Heart ; 4 in Hormonal Disorders ; 15 in Digestive Disorders ; 18 in Geriatrics ; 3 in Gynecology ; 2 in Kidney Disease ; 13 in Neurology ; 12 in Orthopedics ; 9 in Pulmonary disease ; 4 in Rheumatology ; 20 in Urology

Children's Hospital Boston
300 Longwood Avenue
Boston, MA 2115
Ranked: 1 in Pediatrics

Dana-Farber Cancer Institute
44 Binney Street
Boston, MA 2115
Ranked: 4 in Cancer ; 20 in Neurology

Lahey Clinic
41 Mall Road
Burlington, MA 1805
Ranked: 15 in Heart ; 35 in Digestive Disorders ; 44 in Ear, Nose, and Throat ; 19 in Urology

Massachusetts Eye and Ear Infirmary
243 Charles Street
Boston, MA 2114
Ranked: 3 in Ear, Nose, and Throat ; 4 in Ophthalmology

Massachusetts General Hospital
55 Fruit Street
Boston, MA 2114
Ranked: 13 in Cancer ; 3 in Heart ; 2 in Hormonal Disorders ; 4 in Digestive Disorders ; 5 in Geriatrics ; 7 in Gynecology ; 1 in Kidney Disease ; 2 in Neurology ; 3 in Orthopedics ; 16 in Pediatrics ; 1 in Psychiatry ; 7 in Pulmonary disease ; 8 in Rheumatology ; 8 in Urology

McLean Hospital
115 Mill Street
Belmont, MA 2478
Ranked: 4 in Psychiatry

New England Medical Center
750 Washington Street
Boston, MA 2111
Ranked: 41 in Digestive Disorders ; 28 in Kidney Disease

Spaulding Rehabilitation Hospital
125 Nashua Street
Boston, MA 2114
Ranked: 12 in Rehabilitation

BUFFALO-NIAGARA FALLS, NY

Children's Hospital
219 Bryant Street
Buffalo, NY 14222
Ranked: 21 in Pediatrics

Roswell Park Cancer Institute
Elm And Carlton Streets
Buffalo, NY 14263
Ranked: 17 in Cancer

CHARLESTON-NORTH CHARLESTON, SC

Medical University of South Carolina
171 Ashley Avenue
Charleston, SC 29425
Ranked: 24 in Digestive Disorders

CHARLOTTE-GASTONIA-ROCK HILL, NC-SC

Carolinas Medical Center
1000 Blythe Boulevard
Charlotte, NC 28203
Ranked: 36 in Orthopedics ; 26 in Urology

CHARLOTTESVILLE, VA

University of Virginia Health Sciences Center
Jefferson Park Avenue
Charlottesville, VA 22908
Ranked: 22 in Cancer ; 5 in Hormonal Disorders ; 49 in Geriatrics ; 49 in Kidney Disease ; 29 in Neurology ; 22 in Ear, Nose, and Throat ; 34 in Pulmonary disease ; 23 in Urology

CHICAGO, IL

Children's Memorial Hospital
2300 Children's Plaza
Chicago, IL 60614
Ranked: 11 in Pediatrics

Cook County Hospital
1835 West Harrison
Chicago, IL 60612
Ranked: 49 in Cancer ; 35 in Geriatrics ; 32 in Gynecology ; 40 in Neurology ; 38 in Orthopedics ; 26 in Pulmonary disease ; 35 in Rheumatology

Evanston Northwestern Health Care
1301 Central Street
Evanston, IL 60201
Ranked: 48 in Neurology

F.G. McGaw Hospital at Loyola University
2160 South First Avenue
Maywood, IL 60153
Ranked: 37 in Cancer ; 47 in Hormonal Disorders ; 37 in Digestive Disorders ; 45 in Geriatrics ; 50 in Gynecology ; 50 in Ear, Nose, and

Throat ; 39 in Pulmonary disease ; 45 in Urology

Lutheran General Healthsystem
1775 Dempster Street
Park Ridge, IL 60068
Ranked: 47 in Cancer ; 31 in Heart ; 39 in Hormonal Disorders ; 33 in Digestive Disorders ; 47 in Geriatrics ; 48 in Gynecology ; 34 in Orthopedics ; 42 in Ear, Nose, and Throat

Northwestern Memorial Hospital
251 East Huron Street
Chicago, IL 60611
Ranked: 18 in Hormonal Disorders ; 33 in Geriatrics ; 15 in Gynecology ; 38 in Kidney Disease ; 26 in Neurology ; 47 in Orthopedics ; 31 in Ear, Nose, and Throat ; 27 in Rheumatology ; 16 in Urology

Rehabilitation Institute of Chicago
345 East Superior Street
Chicago, IL 60611
Ranked: 31 in Neurology ; 1 in Rehabilitation ; 24 in Rheumatology

Rush-Presbyterian-St. Luke's Medical Center
1653 West Congress Parkway
Chicago, IL 60612
Ranked: 35 in Heart ; 17 in Geriatrics ; 25 in Gynecology ; 27 in Kidney Disease ; 42 in Neurology ; 33 in Orthopedics ; 32 in Ear, Nose, and Throat ; 32 in Pulmonary disease ; 44 in Rheumatology

Schwab Rehabilitation Hospital
1401 S California Boulevard
Chicago, IL 60608
Ranked: 39 in Neurology

University of Chicago Hospitals
5841 South Maryland Avenue
Chicago, IL 60637
Ranked: 7 in Cancer ; 11 in Hormonal Disorders ; 9 in Digestive Disorders ; 13 in Geriatrics ; 19 in Gynecology ; 25 in Kidney Disease ; 16 in Orthopedics ; 34 in Ear, Nose, and Throat ; 20 in Pulmonary disease ; 29 in Rheumatology ; 48 in Urology

University of Illinois Hospital and Clinics
1740 West Taylor Street
Chicago, IL 60612
Ranked: 25 in Geriatrics ; 41 in Kidney Disease ; 46 in Neurology ; 43 in Ear, Nose, and Throat ; 40 in Pulmonary disease

CINCINNATI, OH

Children's Hospital Medical Center
3333 Burnet Avenue
Cincinnati, OH 45229
Ranked: 10 in Pediatrics

Christ Hospital
2139 Auburn Avenue
Cincinnati, OH 45219
Ranked: 48 in Heart

University of Cincinnati Hospital
234 Goodman Street
Cincinnati, OH 45219
Ranked: 50 in Hormonal Disorders ; 16 in Ear, Nose, and Throat ; 29

in Pulmonary disease

CLEVELAND-LORAIN-ELYRIA, OH

Cleveland Clinic
9500 Euclid Avenue
Cleveland, OH 44195
Ranked: 16 in Cancer ; 1 in Heart ; 9 in Hormonal Disorders ; 3 in Digestive Disorders ; 8 in Geriatrics ; 17 in Gynecology ; 4 in Kidney Disease ; 6 in Neurology ; 14 in Ophthalmology ; 5 in Orthopedics ; 10 in Ear, Nose, and Throat ; 17 in Psychiatry ; 8 in Pulmonary disease ; 5 in Rheumatology ; 2 in Urology

Univ. Hospitals of Cleveland (Rainbow Babies & Childrens Hosp.)
11100 Euclid Avenue
Cleveland, OH 44106
Ranked: 7 in Pediatrics ; 42 in Cancer ; 21 in Geriatrics

COLUMBIA, MO

University Hospitals and Clinics
One Hospital Drive
Columbia, MO 65212
Ranked: 40 in Kidney Disease

COLUMBUS, OH

Arthur G. James Cancer Hospital
300 West Tenth Avenue
Columbus, OH 43210
Ranked: 32 in Cancer ; 31 in Gynecology ; 45 in Ear, Nose, and Throat

Ohio State University Medical Center
410 West 10th Avenue
Columbus, OH 43210
Ranked: 24 in Hormonal Disorders ; 44 in Gynecology ; 27 in Ear, Nose, and Throat ; 41 in Pulmonary disease ; 8 in Rehabilitation

DALLAS, TX

Baylor University Medical Center
3500 Gaston Avenue
Dallas, TX 75246
Ranked: 27 in Digestive Disorders ; 38 in Gynecology ; 50 in Kidney Disease ; 50 in Pulmonary disease

Parkland Memorial Hospital
5201 Harry Hines Boulevard
Dallas, TX 75235
Ranked: 16 in Heart ; 19 in Hormonal Disorders ; 10 in Digestive Disorders ; 22 in Geriatrics ; 8 in Gynecology ; 14 in Kidney Disease ; 32 in Neurology ; 17 in Orthopedics ; 24 in Ear, Nose, and Throat ; 20 in Rheumatology ; 21 in Urology

DENVER, CO

Children's Hospital
1056 East 19th Avenue
Denver, CO 80218
Ranked: 5 in Pediatrics

Craig Hospital
3425 South Clarkson Street

INDIANAPOLIS, IN

Clarian Health Partners
1-65 At 21st Street
Indianapolis, IN 46202
Ranked: 14 in Cancer ; 17 in Digestive Disorders ; 43 in Gynecology ; 28 in Neurology ; 47 in Ear, Nose, and Throat ; 31 in Pulmonary disease ; 50 in Rheumatology ; 15 in Urology

St. Vincent Hospital and Health Center
2001 West 86th Street
Indianapolis, IN 46260
Ranked: 38 in Heart ; 41 in Neurology

IOWA CITY, IA

University of Iowa Hospitals and Clinics, Iowa City
200 Hawkins Drive
Iowa City, IA 52242
Ranked: 43 in Cancer ; 48 in Hormonal Disorders ; 40 in Digestive Disorders ; 22 in Neurology ; 6 in Ophthalmology ; 8 in Orthopedics ; 2 in Ear, Nose, and Throat ; 44 in Pulmonary disease ; 40 in Rheumatology

KANSAS CITY, MO-KS

Truman Medical Center-West
2301 Holmes Street
Kansas City, MO 64108
Ranked: 45 in Pulmonary disease

LANSING-EAST LANSING, MI

Sparrow Hospital and Health System
1215 East Michigan Avenue
Lansing, MI 48912
Ranked: 30 in Geriatrics

LEXINGTON, KY

Cardinal Hill Rehabilitation Hospital
2050 Versailles Road
Lexington, KY 40504
Ranked: 50 in Neurology ; 30 in Rheumatology

University of Kentucky Hospital
800 Rose Street
Lexington, KY 40536
Ranked: 19 in Cancer

LITTLE ROCK-NORTH LITTLE ROCK, AR

University Hospital of Arkansas
4301 West Markham Street
Little Rock, AR 72205
Ranked: 28 in Cancer

LOS ANGELES-LONG BEACH, CA

Cedars-Sinai Medical Center
8700 Beverly Boulevard
Los Angeles, CA 90048
Ranked: 40 in Heart ; 36 in Digestive Disorders ; 36 in Gynecology

Children's Hospital
4650 Sunset Boulevard
Los Angeles, CA 90027
Ranked: 5 in Pediatrics

Los Angeles County-Harbor-UCLA Medical Center
1000 West Carson Street
Torrance, CA 90509
Ranked: 49 in Pulmonary disease

Los Angeles County-USC Medical Center
1200 North State Street
Los Angeles, CA 90033
Ranked: 30 in Digestive Disorders ; 32 in Geriatrics ; 23 in Gynecology ; 31 in Kidney Disease ; 16 in Neurology ; 48 in Orthopedics ; 39 in Ear, Nose, and Throat ; 23 in Pulmonary disease ; 18 in Rheumatology ; 35 in Urology

Rancho Los Amigos Medical Center
7601 East Imperial Highway
Downey, CA 90242
Ranked: 10 in Rehabilitation

UCLA Medical Center
10833 Le Conte Avenue
Los Angeles, CA 90095
Ranked: 14 in Pediatrics ; 6 in Ophthalmology ; 6 in Cancer ; 29 in Heart ; 12 in Hormonal Disorders ; 6 in Digestive Disorders ; 1 in Geriatrics ; 4 in Gynecology ; 7 in Kidney Disease ; 10 in Neurology ; 9 in Orthopedics ; 7 in Ear, Nose, and Throat ; 18 in Pulmonary disease ; 7 in Rheumatology ; 4 in Urology ; 6 in Psychiatry

USC University Hospital (Doheny Eye Institute), Los Angeles
Ranked: 7 in Ophthalmology

LOUISVILLE, KY

University of Louisville Hospital
530 South Jackson Street
Louisville, KY 40202
Ranked: 39 in Orthopedics ; 43 in Urology

MADISON, WI

University of Wisconsin Hospital and Clinics
600 Highland Avenue
Madison, WI 53792
Ranked: 33 in Cancer ; 30 in Heart ; 32 in Hormonal Disorders ; 23 in Digestive Disorders ; 47 in Gynecology ; 46 in Kidney Disease ; 16 in Ophthalmology ; 30 in Orthopedics ; 21 in Ear, Nose, and Throat ; 37 in Pulmonary disease ; 38 in Rheumatology ; 27 in Urology

MEMPHIS, TN

Baptist Memorial Hospital
899 Madison Avenue
Memphis, TN 38146
Ranked: 48 in Orthopedics

University of Tennessee Health Science Center
951 Court Avenue
Memphis, TN 38103
Ranked: 29 in Orthopedics

MIAMI, FL

University of Miami (Bascom Palmer Eye Institute)
1611 NW 12th Avenue
Miami, FL 33136
Ranked: 2 in Ophthalmology ; 43 in Kidney Disease ; 42 in Orthopedics

University of Miami, Jackson Memorial Hospital
1100 SW 62nd Avenue
Miami, FL 33155
Ranked: 20 in Pediatrics

MILWAUKEE-WAUKESHA, WI

Froedtert Memorial Lutheran Hospital
9200 West Wisconsin Avenue
Milwaukee, WI 53226
Ranked: 42 in Digestive Disorders ; 39 in Kidney Disease

St. Luke's Medical Center
2900 West Oklahoma Avenue
Milwaukee, WI 53215
Ranked: 48 in Hormonal Disorders

MINNEAPOLIS-SAINT PAUL, MN

Fairview-University Medical Center
2450 Riverside Avenue
Minneapolis, MN 55454
Ranked: 40 in Cancer ; 27 in Geriatrics ; 24 in Kidney Disease ; 36 in Neurology ; 33 in Ear, Nose, and Throat

Hennepin County Medical Center
701 Park Avenue South
Minneapolis, MN 55415
Ranked: 41 in Geriatrics ; 28 in Pulmonary disease ; 48 in Rheumatology

NASHVILLE, TN

St. Thomas Hospital
4220 Harding Road
Nashville, TN 37205
Ranked: 49 in Heart

Vanderbilt University Hospital and Clinic
1161 21st Avenue South
Nashville, TN 37232
Ranked: 23 in Cancer ; 33 in Heart ; 15 in Hormonal Disorders ; 31 in Digestive Disorders ; 21 in Gynecology ; 12 in Kidney Disease ; 45 in Neurology ; 22 in Orthopedics ; 11 in Ear, Nose, and Throat ; 22 in Pulmonary disease ; 18 in Urology

NASSAU-SUFFOLK, NY

North Shore University Hospital
300 Community Drive
Manhasset, NY 11030
Ranked: 43 in Heart ; 38 in Urology

NEW HAVEN-MERIDEN, CT

Yale-New Haven Hospital

20 York Street
New Haven, CT 6504
Ranked: 31 in Cancer ; 38 in Hormonal Disorders ; 18 in Digestive Disorders ; 8 in Geriatrics ; 16 in Gynecology ; 30 in Kidney Disease ; 27 in Orthopedics ; 40 in Ear, Nose, and Throat ; 8 in Psychiatry ; 19 in Pulmonary disease ; 45 in Rheumatology ; 32 in Urology

NEW ORLEANS, LA

Ochsner Foundation Hospital
1516 Jefferson Highway
New Orleans, LA 70121
Ranked: 48 in Digestive Disorders

Touro Infirmary
1401 Foucher Street
New Orleans, LA 70115
Ranked: 47 in Pulmonary disease

West Jefferson Medical Center
1101 Medical Center Boulevard
Marrero, LA 70072
Ranked: 35 in Pulmonary disease ; 49 in Rheumatology

NEW YORK, NY

Hospital for Joint Diseases-Orthopedic Institute
301 East 17th Street
New York, NY 10003
Ranked: 25 in Orthopedics ; 14 in Rheumatology

Hospital for Special Surgery
535 East 70th Street
New York, NY 10021
Ranked: 37 in Geriatrics ; 2 in Orthopedics ; 3 in Rheumatology

Memorial Sloan-Kettering Cancer Center
1275 York Avenue
New York, NY 10021
Ranked: 1 in Cancer ; 21 in Digestive Disorders ; 11 in Gynecology ; 16 in Ear, Nose, and Throat ; 6 in Urology

Mount Sinai-NYU Medical Center
550 First Avenue
New York, NY 10016
Ranked: 16 in Psychiatry

Mount Sinai Medical Center
One Gustave L. Levy Place
New York, NY 10029
Ranked: 27 in Heart ; 42 in Hormonal Disorders ; 5 in Digestive Disorders ; 3 in Geriatrics ; 30 in Gynecology ; 11 in Neurology ; 17 in Ear, Nose, and Throat ; 14 in Rehabilitation

New York Eye and Ear Infirmary
310 East 14th Street
New York, NY 10003
Ranked: 12 in Ophthalmology ; 49 in Ear, Nose, and Throat

New York Presbyterian Hospital
525 East 68th Street
New York, NY 10021
Ranked: 35 in Cancer ; 28 in Heart ; 14 in Hormonal Disorders ; 22 in Digestive Disorders ; 9 in Gynecology ; 5 in Kidney Disease ; 4 in

Neurology ; 28 in Orthopedics ; 2 in Psychiatry ; 5 in Urology ; 9 in Pediatrics

New York University Medical Center
550 First Avenue
New York, NY 10016
Ranked: 28 in Geriatrics ; 24 in Neurology ; 7 in Rehabilitation ; 15 in Rheumatology ; 28 in Urology

NEWARK, NJ

Kessler Institute for Rehabilitation
1199 Pleasant Valley Way
West Orange, NJ 7052
Ranked: 4 in Rehabilitation

NEWBURGH, NY

St. Luke's Hospital
70 Dubois Street
Newburgh, NY 12550
Ranked: 34 in Neurology ; 18 in Rheumatology

NORFOLK-VIRGINIA BEACH-NEWPORT NEWS, VA

Sentara Norfolk General Hospital
600 Gresham Drive
Norfolk, VA 23507
Ranked: 37 in Heart

ORANGE COUNTY, CA

University of California, Irvine Medical Center
101 The City Drive
Orange, CA 92868
Ranked: 33 in Gynecology

ORLANDO, FL

Florida Hospital Medical Center
601 East Rollins Street
Orlando, FL 32803
Ranked: 32 in Heart ; 34 in Hormonal Disorders ; 49 in Digestive Disorders

Orlando Regional Medical Center
1414 Kuhl Avenue
Orlando, FL 32806
Ranked: 17 in Heart

PHILADELPHIA, PA

Albert Einstein Med. Center (Moss Rehab. Hosp.), Philadelphia
Ranked: 16 in Rehabilitation

Children's Hospital of Philadelphia
34th St & Civic Center Blvd
Philadelphia, PA 19104
Ranked: 2 in Pediatrics

Fox Chase Cancer Center
7701 Burholme Avenue
Philadelphia, PA 19111
Ranked: 20 in Cancer

Hospital of the University of Pennsylvania
3400 Spruce Street
Philadelphia, PA 19104
Ranked: 8 in Cancer ; 25 in Hormonal Disorders ; 12 in Digestive Disorders ; 20 in Geriatrics ; 16 in Gynecology ; 17 in Kidney Disease ; 8 in Neurology ; 17 in Ophthalmology ; 23 in Orthopedics ; 9 in Ear, Nose, and Throat ; 15 in Psychiatry ; 35 in Pulmonary disease ; 20 in Rehabilitation ; 23 in Rheumatology ; 17 in Urology

Lankenau Hospital
100 Lancaster Avenue West
Wynnewood, PA 19096
Ranked: 50 in Heart

St. Christopher's Hospital
Erie Avenue At Front Street
Philadelphia, PA 19134
Ranked: 23 in Pediatrics

Temple University Hospital
Broad And Ontario Streets
Philadelphia, PA 19140
Ranked: 44 in Digestive Disorders

Thomas Jefferson University Hospital
111 South 11th Street
Philadelphia, PA 19107
Ranked: 19 in Heart ; 43 in Digestive Disorders ; 40 in Geriatrics ; 27 in Gynecology ; 38 in Ear, Nose, and Throat ; 9 in Rehabilitation ; 31 in Urology

Wills Eye Hospital
900 Walnut Street
Philadelphia, PA 19107
Ranked: 3 in Ophthalmology

PHOENIX-MESA, AZ

Good Samaritan Regional Medical Center
1111 East Mcdowell Road
Phoenix, AZ 85006
Ranked: 30 in Hormonal Disorders

St. Joseph's Hospital and Medical Center
350 West Thomas Road
Phoenix, AZ 85013
Ranked: 15 in Neurology

PITTSBURGH, PA

Allegheny General Hospital
320 East North Avenue
Pittsburgh, PA 15212
Ranked: 25 in Cancer ; 41 in Hormonal Disorders ; 28 in Digestive Disorders ; 40 in Orthopedics

Children's Hospital of Pittsburgh
3705 Fifth Avenue
Pittsburgh, PA 15213
Ranked: 4 in Pediatrics

Magee-Womens Hospital
300 Halket Street
Pittsburgh, PA 15213

Ranked: 13 in Gynecology

University of Pittsburgh Medical Center
200 Lothrop Street
Pittsburgh, PA 15213
Ranked: 15 in Cancer ; 21 in Heart ; 23 in Hormonal Disorders ; 11 in Digestive Disorders ; 31 in Geriatrics ; 15 in Kidney Disease ; 13 in Orthopedics ; 6 in Ear, Nose, and Throat ; 10 in Psychiatry ; 17 in Pulmonary disease ; 17 in Rheumatology

PORTLAND-VANCOUVER, OR-WA

University Hospital
3181 SW Sam Jackson Park Road
Portland, OR 97201
Ranked: 28 in Hormonal Disorders ; 36 in Kidney Disease

PROVIDENCE-FALL RIVER-WARWICK, RI

Women and Infants Hospital of Rhode Island
101 Dudley Street
Providence, RI 2905
Ranked: 41 in Gynecology

RALEIGH-DURHAM-CHAPEL HILL, NC

Duke University Medical Center
Erwin Road
Durham, NC 27710
Ranked: 6 in Cancer ; 6 in Heart ; 20 in Hormonal Disorders ; 7 in Digestive Disorders ; 4 in Geriatrics ; 6 in Gynecology ; 8 in Kidney Disease ; 9 in Neurology ; 8 in Ophthalmology ; 6 in Orthopedics ; 20 in Ear, Nose, and Throat ; 17 in Pediatrics ; 7 in Psychiatry ; 13 in Pulmonary disease ; 9 in Rheumatology ; 7 in Urology

University of North Carolina Hospitals
101 Manning Drive
Chapel Hill, NC 27514
Ranked: 38 in Cancer ; 31 in Hormonal Disorders ; 47 in Digestive Disorders ; 39 in Geriatrics ; 10 in Gynecology ; 23 in Kidney Disease ; 43 in Orthopedics ; 23 in Ear, Nose, and Throat ; 21 in Pulmonary disease ; 47 in Urology

ROCHESTER, MN

Mayo Clinic
200 First Street Southwest
Rochester, MN 55905
Ranked: 5 in Cancer ; 2 in Heart ; 1 in Hormonal Disorders ; 1 in Digestive Disorders ; 6 in Geriatrics ; 2 in Gynecology ; 3 in Kidney Disease ; 1 in Neurology ; 11 in Ophthalmology ; 1 in Orthopedics ; 4 in Ear, Nose, and Throat ; 12 in Pediatrics ; 9 in Psychiatry ; 2 in Pulmonary disease ; 5 in Rehabilitation ; 1 in Rheumatology ; 3 in Urology

SACRAMENTO, CA

University of California, Davis Medical Center
2315 Stockton Boulevard
Sacramento, CA 95817
Ranked: 36 in Hormonal Disorders ; 39 in Digestive Disorders ; 46 in Geriatrics ; 29 in Kidney Disease ; 31 in Orthopedics ; 38 in Ear, Nose, and Throat ; 24 in Pulmonary disease ; 47 in Rheumatology ; 37 in Urology

SAINT LOUIS, MO

Barnes-Jewish Hospital
1 Barnes-Jewish Hosp Plaza
Saint Louis, MO 63110
Ranked: 45 in Cancer ; 11 in Heart ; 8 in Hormonal Disorders ; 13 in Digestive Disorders ; 14 in Geriatrics ; 24 in Gynecology ; 9 in Kidney Disease ; 7 in Neurology ; 13 in Ophthalmology ; 19 in Orthopedics ; 13 in Ear, Nose, and Throat ; 4 in Pulmonary disease ; 13 in Rheumatology ; 9 in Urology

St. Louis University Hospital
3635 Vista At Grand Boulevard
Saint Louis, MO 63110
Ranked: 23 in Heart ; 26 in Hormonal Disorders ; 29 in Digestive Disorders ; 7 in Geriatrics ; 33 in Kidney Disease ; 32 in Orthopedics ; 29 in Ear, Nose, and Throat ; 25 in Pulmonary disease ; 33 in Rheumatology ; 40 in Urology

St. Luke's Hospital
232 South Woods Mill Road
Chesterfield, MO 63017
Ranked: 42 in Geriatrics

SAN ANTONIO, TX

Bexar County Hospital District
4502 Medical Drive
San Antonio, TX 78229
Ranked: 47 in Kidney Disease ; 14 in Orthopedics ; 49 in Urology

SAN DIEGO, CA

UCSD Medical Center
200 West Arbor Drive
San Diego, CA 92103
Ranked: 10 in Pulmonary disease ; 43 in Rheumatology

SAN FRANCISCO, CA

San Francisco General Hospital Medical Center
1001 Potrero Avenue
San Francisco, CA 94110
Ranked: 27 in Pulmonary disease

University of California, San Francisco Medical Center
500 Parnassus
San Francisco, CA 94143
Ranked: 36 in Cancer ; 14 in Heart ; 7 in Hormonal Disorders ; 8 in Digestive Disorders ; 18 in Geriatrics ; 20 in Gynecology ; 16 in Kidney Disease ; 5 in Neurology ; 10 in Ophthalmology ; 21 in Orthopedics ; 19 in Ear, Nose, and Throat ; 13 in Pediatrics ; 13 in Psychiatry ; 6 in Pulmonary disease ; 10 in Rheumatology ; 11 in Urology

SAN JOSE, CA

Lucile Packard Children's Hospital
300 Pasteur Drive
Stanford, CA 94305
Ranked: 15 in Pediatrics ; 10 in Cancer ; 8 in Heart ; 18 in Hormonal Disorders ; 18 in Digestive Disorders ; 19 in Geriatrics ; 12 in Gynecology ; 13 in Kidney Disease ; 19 in Neurology ; 16 in Orthopedics ; 12 in Ear, Nose, and Throat ; 11 in Psychiatry ; 18 in

Pulmonary disease ; 17 in Rehabilitation ; 11 in Rheumatology ; 10 in Urology

SAVANNAH, GA

Memorial Medical Center
4700 Waters Avenue
Savannah, GA 31404
Ranked: 44 in Hormonal Disorders ; 46 in Pulmonary disease

SEATTLE-BELLEVUE-EVERETT, WA

Children's Hospital and Medical Center
4800 Sand Point Way NE
Seattle, WA 98105
Ranked: 18 in Pediatrics

Harborview Medical Center
325 Ninth Avenue, Box 359717
Seattle, WA 98104
Ranked: 7 in Orthopedics ; 43 in Pulmonary disease

University of Washington Medical Center
1959 NE Pacific St, Box 356151
Seattle, WA 98195
Ranked: 12 in Cancer ; 34 in Heart ; 13 in Hormonal Disorders ; 32 in Digestive Disorders ; 12 in Geriatrics ; 34 in Gynecology ; 19 in Kidney Disease ; 10 in Orthopedics ; 14 in Ear, Nose, and Throat ; 11 in Pulmonary disease ; 3 in Rehabilitation ; 22 in Urology

SPRINGFIELD, IL

St. John's Hospital
800 East Carpenter Street
Springfield, IL 62769
Ranked: 44 in Cancer

TAMPA-SAINT PETERSBURG-CLEARWATER, FL

H. Lee Moffitt Cancer Center
12902 Magnolia Drive
Tampa, FL 33612
Ranked: 21 in Cancer

TOPEKA, KS

C. F. Menninger Memorial Hospital
5800 West Sixth Avenue
Topeka, KS 66606
Ranked: 3 in Psychiatry

TUCSON, AZ

University Medical Center
1501 North Campbell Avenue
Tucson, AZ 85724
Ranked: 30 in Cancer ; 25 in Heart ; 38 in Geriatrics ; 28 in Gynecology ; 42 in Kidney Disease ; 37 in Neurology ; 44 in Orthopedics ; 38 in Pulmonary disease ; 34 in Rheumatology ; 42 in Urology

WASHINGTON, DC

Children's National Medical Center
111 Michigan Avenue NW
Washington, DC 20010
Ranked: 19 in Pediatrics

Doctors Community Hospital
8118 Good Luck Road
Lanham, MD 20706
Ranked: 30 in Neurology ; 21 in Rheumatology

Georgetown University Hospital
3800 Reservoir Road NW
Washington, DC 20007
Ranked: 48 in Cancer ; 46 in Heart ; 43 in Hormonal Disorders ; 20 in Digestive Disorders ; 24 in Geriatrics ; 22 in Gynecology ; 48 in Kidney Disease ; 21 in Neurology ; 33 in Orthopedics ; 30 in Ear, Nose, and Throat ; 30 in Pulmonary disease ; 25 in Rheumatology ; 50 in Urology

Howard University Hospital
2041 Georgia Avenue NW
Washington, DC 20059
Ranked: 39 in Heart

National Rehabilitation Hospital
102 Irving Street NW
Washington, DC 20010
Ranked: 44 in Neurology ; 13 in Rehabilitation ; 26 in Rheumatology

Washington Hospital Center
110 Irving Street NW
Washington, DC 20010
Ranked: 50 in Cancer ; 44 in Heart ; 22 in Hormonal Disorders ; 49 in Neurology ; 46 in Ear, Nose, and Throat ; 33 in Urology

WILMINGTON-NEWARK, DE

Christiana Care Health System, Wilmington, Delaware
501 West 14th Street
Wilmington, DE 19801
Ranked: 47 in Heart ; 49 in Hormonal Disorders

WORCESTER, MA

Medical Center of Central Massachusetts
119 Belmont Street
Worcester, MA 1605
Ranked: 49 in Orthopedics

YOUNGSTOWN-WARREN, OH

Hillside Rehabilitation Hospital
8747 Squires Lane NE
Warren, OH 44484
Ranked: 39 in Rheumatology

N/A

Augusta Health Care, Fishersville, Va.
96 Medical Center Drive
Fishersville, VA 22939
Ranked: 43 in Geriatrics

John D. Archbold Memorial Hospital, Thomasville, Ga.
Gordon Avenue At Mimosa Drive

Thomasville, GA 31792
Ranked: 44 in Geriatrics

Mary Hitchcock Memorial Hospital, Lebanon, N.H.
One Medical Center Drive
Lebanon, NH 3766
Ranked: 45 in Heart ; 36 in Digestive Disorders ; 99 in Gynecology ; 45 in Orthopedics

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3/9/48 (Item 3 from file: 275)
DIALOG(R)File 275:Gale Group Computer DB(TM)

01584388 SUPPLIER NUMBER: 13440954 (THIS IS THE FULL TEXT)
Creating a CD-ROM: overview of the product field. (CD-ROM authoring and data retrieval software packages; includes company directory and related article on resources for doing research) (Buyers Guide)
Banet, Bernard
Seybold Report on Desktop Publishing, v7, n6, p3(29)
Feb 1, 1993
DOCUMENT TYPE: Buyers Guide ISSN: 0889-9762 LANGUAGE: ENGLISH
RECORD TYPE: FULLTEXT
WORD COUNT: 17829 LINE COUNT: 01443

TEXT:

Last August, we published a broad overview of the cd-rom publishing process. this month, we continue that discussion by characterizing some of the specific software tools, called authoring systems, that prepare and index text, data and graphics for inclusion on cd-rom discs.

You don't need an authoring system to publish a cd-rom title. You could organize a collection of typesetting, word processing, graphics, database, spreadsheet, audio and/or digital motion video files into dos directories or Mac folders, up to 700 megabytes' worth, and send them off to be premastered, mastered and replicated. The resulting cd-roms would, however, present certain problems to the user, such as how to find anything in all of those files and how to display, listen to, print, or otherwise utilize the data.

To solve these problems, you might consider including some garden-variety pc application software on the disc: a desktop publishing program, a database manager, a full-text search package, etc., that would be able to access, manipulate, and output the information. This approach, however, would run into further difficulties: the need to pay licensing fees for each program on each disc; the discovery that programs designed for standard desktop computer applications are not optimized for cd-rom; and the realization that requiring a separate application program for each type of data is not the way to create a coherent information product.

The functions of retrieval software

The alternative to putting only data on a cd-rom, or to including standard desktop programs on the disc, is to incorporate a specialized cd-rom retrieval program on each cd that can find and display the information the user requests, from whatever data formats are on the disc. Ideally, the user would be able to print and download the information as well. The retrieval software is analogous to the runtime module of a database management system.

Retrieval software includes the search engine that reads the index files and locates the sought-after information, and a user interface that presents the options and interprets the user's choices. The cd-rom user interface prompts users to frame and refine search queries and to navigate through a large amount of text, data and graphic material without getting lost in hyperspace.

Building the disc

Understanding the role of cd-rom retrieval programs, we turn to build, or authoring software. Cd-rom "authoring" programs prepare the data files for a cd-rom title to be accessed by a specific retrieval program. The authoring tools import text and other files, organize and index them so that they can be searched and displayed by the retrieval software.

Note that "authoring" does not imply creation of original material for cd-rom. As used in the cd-rom industry, the term implies processing content from a variety of computer-readable files to make it accessible to a user, with the aid of the matching retrieval program, on a cd-rom-equipped computer.

In general, the authoring, or build, tools and the retrieval software are "made for each other" and sold by the same vendor as a package. The two

complementary modules must at this point be considered together by the prospective buyer.

Linear process. The process of building a master disc is much the same in principle, regardless of the type of information it includes. The basic steps are as follows: * Setting up, modifying or developing the user interface program that will be the front end for the retrieval software; * Building the disc's database by defining, in software, the database structure used to organize the content; * Verifying that the files to be imported into the application are consistently and properly formatted; * Importing and marking up the data to make it fit the structure of the new title; * Verifying that the files have been imported as intended and flagging possible errors and inconsistencies; * Adding ("hyper") links among the data elements, either manually or automatically; * Indexing the data so that desired material can be found quickly and efficiently; * Simulating, from the hard disk drive, the functioning of the title with the retrieval software that will be used with it;

* Debugging and revising the data and application as needed; and
* Outputting files for submission to in-house premastering or (on removable media) to premastering/mastering at a disc replication facility ("pressing plant").

These cd-rom data preparation procedures come after the title's database structure and retrieval interface have been designed conceptually. They also sometimes follow preliminary data conversion steps, such as digitizing of nondigital source materials (paper documents, for example) and conversion of digital data such as word processing files to formats that the authoring software can process. The authoring package won't always provide all the utilities for scanning pictures or page images, converting text on paper to ascii characters, and stripping or rewriting codes in publishing files that are foreign to the indexing and retrieval utilities. Authoring packages vary considerably in the file formats and data types that they can import, and the way in which these files are further processed for compatibility with the retrieval software.

For potential publishers, evaluation of the performance and ease of use of the data preparation tools themselves has been, in practice, secondary to the retrieval software, which determines the functionality and performance of the title to be distributed. There is, however, variation also in the power, performance and ease of use of the authoring programs.

Looking over the field

This article will be an overview of some of the most widely used cd-rom authoring and retrieval packages and the features that differentiate one from another. This roundup isn't intended to be a buying guide or product evaluation. It is designed to help narrow the search for software that might meet a particular cd-rom publishing need. The information comes from questionnaires filled out by vendors, vendor product summaries and interviews.

We will focus primarily on programs that can deal competently with possibly hundreds of megabytes of text and images derived from documents and books, or with data from structured database records with defined fields, omitting authoring packages with a multimedia (audio and motion video) emphasis to the exclusion of large amounts of text, those that are not optimized for cd-rom use, and those that do not have a licensing arrangement for including retrieval software on each cd-rom.

We will not include authoring and retrieval packages that are intended for specialized platforms such as Sony's Bookware for the Multimedia cd-rom player (MMCD) and SEBAS, the Sony Electronic Book Authoring System for the Data DiscMan. The packages we list can prepare data for premastering into iso 9660 format, into Macintosh hfs format, or both, and have retrieval programs that run on one or more of the common desktop platforms: Intel/ms-dos, dos plus Windows, or Macintosh.

Retrieval programs that are marketed as engines only -- that is, those without a user interface -- are also not listed here. Fulcrum Technologies' Ful/Text and Sony Electronic Publishing Company's FTR (full-text retrieval) packages, for example, supply a retrieval engine or software database server without a user interface. Retrieval engines such as Fulcrum's are

intended to be embedded in other vendors' more complete retrieval offerings or are mated by the cd-rom publisher with a custom-programmed user interface.

We also have not included the page-based wysiwyg viewers, such as Interleaf's WorldView, Northern Telecom's Helmsman, Thaumaturgy's EDDARS and Frame Technology's FrameViewer. If you have source files in a robust electronic form, these products are worth examining as alternatives to the more traditional, text-based approach.

How the packages differ

Selecting cd-rom authoring and retrieval software means looking for programs that can manage the kinds and quantity of data planned for the title or series, and that are suited to the expectations and experience of likely users, and the computer platforms and configurations available to them.

Cd-rom authoring and retrieval programs represent the confluence of several families of software. Each cd-rom authoring/retrieval package can borrow techniques from database management systems, including document management and full-text retrieval; word processing and desktop publishing; presentation graphics; hypertext; video and computer games; computer-based training; and multimedia.

Database models. The ancestors of some cd-rom retrieval packages, removed by several generations, were online abstract and index databases used in library timesharing applications to search for relevant articles and publications. These often used a keyword approach to locate relevant content. Although full-text indexing and search tools are the heart and soul of many of the retrieval modules, text documents are still often described by and linked to records with defined fields such as "author," "date," "title," "subject" and so on.

Database technology in general influences the underlying search engines, query languages, user interfaces and data models. Most frequently, structured cd-rom data is organized into the fields-in-records of a simple flat file or table. Cd-rom authoring packages may also borrow concepts, or at least vocabulary, from relational, hierarchical or object-oriented approaches. MediaBase uses a hierarchical outline as its organizing theme, for example, while HyperWriter/HyperReader links multimedia "objects."

Fielded data and fields within text. Some cd-rom authoring/retrieval software has been explicitly optimized for structured, fielded data. An example of such data would be a telephone directory, where fields such as first name, last name, street address, city and phone number are obvious ways to enter and store the data. Dataware's CD Author/CD Answer and Key Record Build/Record ReferenceBook and Knowledge Access KAware for fielded data are examples of packages designed for structured, relatively short, records.

Most text-oriented packages also borrow structured record organization, utilizing defined fields as search keys for text documents or sections. Fielded records as part of text files or linked to text files allow the user to constrain a search to the Author field, for example, in a database of book abstracts, for example, or to the Director field in a database of movie descriptions. Most cd-rom retrieval packages are based on full-text retrieval engines. Even the "fielded" information in many of them is handled as a marked-up part of a text file, readable as such, rather than stored in a fixed-length format or in a variable-length record format with fields separated only by a comma or other delimiter.

There is considerable variation in the flexibility with which different packages can use fields in searches, whether, for example, they support Boolean searches within and across fields; range searches, such as "between 1945 and 1980?" or "<$200,000.00"; sorts of data records, such as list by order of total revenue, of net profits, or of year released; nested sorts (movies by gross box office receipts by year, for example); export of fielded data to external databases; calculations on data from the structured records; or report definition and creation.

Techniques from print publishing. Cd-rom retrieval software increasingly borrows publishing systems technology for coding typography, page layout and logical document structure, as well as relating drawings

and photographs to text. Retrieval packages for dos-only systems, however, typically deal with text simply as ascii characters, often even without character attributes, such as "bold" or "underlined," and without font information. Windows and Mac authoring/retrieval programs, on the other hand, often incorporate font codes and font display and printing. The gui-based retrieval programs can usually present text and graphics on the screen at the same time, either in a compound document or in separate windows.

Sgml is beginning to be incorporated in authoring software, in order to facilitate retention and cross-platform utilization of typographical features and to allow the logical structure of a document to aid user searches and navigation. Authoring packages such as Dataware Full Text Build/Text ReferenceBook and CD Author/CD Answer HyperText use sgml markup, accepting sgml-tagged documents as input, or using sgml as an intermediate scheme for file conversion, or retaining sgml markup on the cd-rom. Some vendors that do not currently support sgml, or that make limited use of sgml, have announced that sgml markup will be incorporated in future authoring products. These vendors include ZyLab, KnowledgeSet and TMS.

PostScript and other page-description technologies are beginning to become available for cd-rom. KnowledgeSet, for example, has announced that it will support PostScript in a future release of KRS. As we mentioned above, there are also page-based viewers, some of which support PostScript directly (EDDARS) and some of which convert PostScript files (Helmsman).

Hypertext. Hypertext/hyperlink mechanisms provide ways to navigate other than scrolling through a text file. If the system knows about the logical structure of the documents, the links might be used to hop from the table of contents to the heading in the text. The links also enable the author or publisher to relate disparate pieces of information, such as pointing the reader to a citation in another document. Hyperlinks, variously defined, are important features in many of the programs. Hyperlinks may include: * Jumping from a word or phrase to other occurrences of that phrase in other locations; * Jumping to related material, such as in a "see also" reference in an encyclopedia;

* Jumping to footnotes, citations, glossaries or maps;
* Requesting expansion of a passage into a treatment in greater depth; * Requesting a graphic or playing a multimedia clip from a point in the text; * Jumping from a specific point in a graphic to other information; and * Jumping from the table of contents to a specific section or chapter.

Some of the fullest implementations of hyperlinks can be seen in Ntergaid's HyperWriter/HyperReader, Compton's SmarTrieve and CD Author/CD Answer HyperText.

Presentation and training features. Cd-rom retrieval packages can also borrow concepts from presentation software and computer-based training, leading the user through a scripted flow sequence that branches according to the user's responses. Training and presentation software also provide the prototypes for being able to control physical audio/visual devices such as videodisc players and software multimedia viewers or players.

Page images. When the cd-rom publisher starts with printed pages and does not have digital files to start with, the technologies of document image processing -- scanning and retrieving printed pages as bitmapped images -- can be used. Increasingly in packages such as CD Author HyperText, SearchExpress and ZyIndex, the raster image file is linked to character-based versions of the same content to permit full-text indexing. Authoring packages such as SearchExpress and ZyImage are now offering ocr modules that can process the page images into searchable text.

Text search. The key problem for cd-rom text management, and at the same time its key advantage, is finding what you are looking for within a mountain of text. For collections of related articles and for structured documents, a common technique is full-text indexing.

Full-text indexing is logically similar to the familiar back-of-the-book index: It is a way for the reader to find passages or documents that contain specific terms. But electronic indexing is superior because of its capability to look up virtually any word that might appear

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on the disc and because of the speed with which it can take the user quickly to the located passages, which can number in the thousands on a cd-rom. Electronic indexing can also assist the user in evaluating the relevance of a search "hit" prior to viewing the document.

Full-text indexing software can maintain a list of each word in the text and where each token or instance of it may be found. Often, however, this basic technique pulls up too many "hits" that are irrelevant to the searcher's quest, and ignores too many relevant items that contain synonyms, related terms or slight variations on the search terms. To cope with these central limitations of literal string searching, a number of techniques can be used: * Providing a "stop list" of common words that occur too frequently to be useful in a word search. These words are simply not indexed. Sometimes the author or the user (or both) can modify the list of stop words by making the list larger or smaller. * Allowing the user to search for phrases and individual words. "Disk drive" can be a more useful search term than "disk" or "drive" alone. * Combining search terms with Boolean operators (and, or xor, not). For example: Find references to "cd-rom" or "optical disc" or find references to "Edison" and "light bulb" in the same document. Some programs support complex, nested Boolean searches, while others keep it simple to avoid intimidating users. * Providing automatic "stemming" that can find related words such as plurals of nouns or past tenses of verbs, though the endings may be different. A search for "atomic bomb" would also pull up references to atomic bombs and atomic bombing. * Allowing a wildcard be specified in a string search. A search for "optical dis*" could find "optical disc" or "optical disk." * Using fuzzy logic to overcome spelling errors or multiple spellings. Some programs can find "optical disk" as possibly relevant to "optical disc" automatically, because they are "close enough" for the hit to be brought to the user's attention. * Allowing the user to specify other proximity parameters, e.g., look for "cd-rom" and "authoring" within five words of one another. * Encoding the logical structure of a document or collection of documents via sgml and using this (or similar) markup to allow the user to constrain full-text searches to specific books, chapters, sections, pages, paragraphs. * Ranking the documents that contain search "hits" for possible relevance. Many relevance algorithms exist. Some simply count the number of hits (e.g., KnowledgeSet's KRS). Others consider patterns of co-occurrence of terms within a search item and weight rare words and phrases more highly than common ones (e.g., Personal Librarian). Some programs (e.g., SearchExpress) allow the user to assign weights to different terms manually for a given search. * Looking for related terms, or at the very least for synonyms, is a way of going beyond literal string searching. Usually

this involves consulting or constructing a thesaurus (e.g., Dataware's ReferenceBook) or a more elaborate hierarchical semantic network (e.g., SmarTrieve) to represent how the meanings of terms interrelate. Either the authoring system developer, the title developer or the user (depending on the implementation) -- or all of the above -- could instruct such a retrieval system that "authoring" is related to "building" and "indexing" and a hit on "building" should be treated as a hit on "authoring."

Convergent evolution

Cd-rom authoring and retrieval products tend to be developed initially with an emphasis on structured records or text search, or hypertext, but over time they take on features of the other approaches.

Structured database-oriented programs get better at managing free-form text and develop user interfaces with alternatives to conventional query languages. Text-oriented programs add data fields and the features of structured record retrieval, as well as logical markup * la sgml. Other examples of this convergence include: * Full-text indexing is enhanced with relevance-ranking algorithms. * Text files are linked to page images of original printed documents. Authoring/retrieval packages that began with plain ascii characters become able to deal with typographical features. * Text becomes hypertext. Graphics become multimedia. Hypertext becomes hypermedia. * Page-oriented models based on publishing technologies add search and navigation capabilities.

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This convergence of retrieval features is not just the result of competition among vendors. It also stems from the fact that desktop systems keep getting more powerful, and the basic system software keeps improving in its capability to present typography, graphics and multimedia.

Data types and formats. One way to keep track of what an authoring/retrieval package can or cannot do is to ask, "What data types and specific formats are supported?" The chart on pages 6-7 shows the data types and formats each package can import and retrieve in some manner. Note that importing data and converting it to the authoring system's preferred format may or may not strip it of some of its richness, whether the data is in the form of text or graphics. Note, too, that some retrieval software can make use of external viewer or player programs, called by (or "spawned" or "launched" from) the retrieval program but separate from it. This is a flexible approach to handling graphics and multimedia files, even text files, but there may be a penalty to be paid in performance, and there may be problems with pricing and licensing.

There is sometimes a need to restrict access to data on a cd-rom for security reasons or to protect copyrighted material, for example. Various packages support different techniques: data encryption, password protection, output limitations and the ability to lock and unlock specific content on the disc. This last feature can be used by mailing list or software publishers, for example, who can distribute millions of names or hundreds of programs at once but who can sell access to a limited subset as a particular user needs it.

Platforms. The hardware constraints in the target delivery systems can be an important factor in selecting a retrieval package. In general, the dos-only retrieval software will run adequately on '286-class systems with 640k of ram, while windows packages will assume a windows-capable system in the '386 or '486 class with probably 4 mb of memory.

Some retrieval programs, such as Romware from Nimbus, have been specifically developed to run without workspace on a magnetic drive, while others assume that users will have several megabytes free on their hard disks. Many packages are flexible in this respect, benefiting in performance from at least a megabyte or so of space on the hard disk, but also capable of being run from the cd-rom disc alone or with workspace available on a floppy.

The chart on page 11 shows the software environments that are supported by the packages that we are considering.

Looking at the build tools

As noted above, the authoring tools themselves often get less consideration than the features directly experienced by end users through the retrieval module. Nevertheless, it is the build tools that the publisher spends the most time with, and some vendors have gone to greater lengths than others to make life easier for the preparation staff. Some of the features publishers look at are: * The development platforms supported, and the hardware and system software requirements. For example: How much disk space is needed on the development or authoring system hardware relative to the size of the data files that will be indexed? Usually 2-5 times as much disk space is required. Can authoring be done on a lan? Is there support for cross-platform development? * Style of the user interface for authoring. Is there one program or a collection of separate modules that must be run independently? * The kinds and formats of data a package accepts for import; file conversion utilities built into the package; procedures for importing and marking up data, creating hyperlinks, indexing the data, testing, debugging, revising the files and indexes. * How quickly does the software accomplish the above tasks? Index building is usually in the 1 to 50 megabytes per hour range, averaging between 10 and 20, according to the vendors. Of course, this varies not only with the package but also with the data and the design. * What kinds of file-compression techniques are used? What is the maximum size of the source files that can included on a cd-rom? * What is the overhead generated by the indexing process, as a fraction of the file size of the original files? Par is something like 35% for text files. A high ratio of index to data on the disc itself may, however, only reflect the fact that the data files are

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efficiently compressed. A low ratio may reflect a too-simple indexing scheme. For fielded data it is possible that the original files and the index files together are smaller than the original data files, due to compression. * How can the user interface be customized for a particular publisher or title? Before going the custom programming route, it makes sense to look for off-the-shelf authoring software that lets the publisher customize the search program without writing new code. Some of these methods for customizing the user interface include removing options from the menu, changing the command structure, and redefining function keys or menu screens.

Some vendors permit modifications to source code, others do not. Many of the authoring packages that we list and that do make available a standard user interface also provide an optional api (application programming interface) with a toolkit for linking a custom-developed user interface to the retrieval engine. Authoring systems with an optional api version of

their product include SmarTrieve, MediaBase, CD Author/CD Answer, Romware, Search Express, KRS, Re:Search, PLS Personal Librarian and TextWare. * Premastering tools are sometimes available from the authoring vendor as an option, as is the case with Crowninshield, Knowledge Access or Dataware. It is useful to know which output devices the premastering software supports (dat, 8mm tape, 9-track tape, worm etc.) and whether recordable cd is one of them.

Pricing

There is considerable diversity in the pricing approaches of the cd-rom authoring and retrieval software vendors, and in the total prices, fees and royalties to the developer of using a particular set of authoring tools. Pricing of cd-rom authoring/retrieval tools is based on one or more of the following elements:

* The purchase price of the authoring tools;
* The pricing schedule of per-title (first title, second title... unlimited titles) licensing fees for use of the authoring software;
* The price of the initial retrieval module;
* The pricing schedule of per-unit royalties for the runtime retrieval software, which can be set as a function of quantity of units (number of discs), the sale price, etc; * There may also be maintenance fees (beginning the first or second year) for the publisher and, in some cases, for the buyers of the cd-rom products.

The licensing fees and royalties for using authoring and retrieval software can be a few hundred dollars for an unlimited number of titles and units, or they can be in the tens or hundreds of thousands of dollars.

We've summarized the licensing practices of each of the vendors in the chart on page 9.

Services

Along with software tools, many authoring system vendors also will provide assistance with the steps in the authoring process, including title design, data capture, file conversion, indexing, interface customization and programming. They will also often help with premastering and disc replication, if desired. Support can be vital in producing a cd-rom title. Find out whether the support you need is available from the vendor, and at what price.

Resources

In doing your research, you will want to check the vendor's history and experience, including a peek at titles that have been published with the packages in which you are interested. The SIGCAT Software Showcase 1992 (in iso 9660 format for dos) is still a useful sample cd-rom disc, containing the retrieval modules from ten commercially available cd-rom database products mated with the identical database.

It is available from Dr. Ash Pahwa, Cd-rom Strategies, Inc., 18 Chenile, Irvine, CA 92724; phone (714) 733-3378, fax (714) 786-1401. Enclose a self-addressed envelope with postage, both of which accommodate a cd. Not all of the packages, unfortunately, are fully functional as transferred to this disc, due to a security feature in some of the software that detected (innocently) modified date stamps on the files.

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Another reasonably current resource (in printed form) is the Apple Cd-rom Handbook: A Guide to Planning, Creating and Producing a Cd-rom. Written by Apple Computer, it was published by Addison-Wesley in July 1992 ($14.95). (Of course this book is Mac/HFS oriented, rather than iso 9660, but it is still a useful reference.)

Consider also the following publications, in addition to those mentioned in our August article: * Meckler's newsletters, including, Multimedia/CD Publisher and

Cd-rom Librarian. Meckler Publishing, 11 Ferry Lane West, Westport CT 06880; phone (203) 226-6967, fax (800) 858-3144. (Personal subscriptions and K-12 school libraries get lower rates than other institutional subscribers.) * Cd-rom Collection Builder's Toolkit: 1992. $39.95. Toolkit 92/11 Tannery Lane, Weston, CT 06883; phone (800) 248-8466, fax (203) 222-0122. * The Cd-rom Directory 1992 (860-page book, $149) or Cd-rom

Directory ON DISC (on cd-rom, $199). Published by TFPL (London) and distributed by UniDisc, 3941 Cherryvale Ave., Suite 1, Soquel, CA 95073; phone (408) 464-0707, fax (408) 464-0187.

Compton's NewMedia 2320 Camino Vida Roble Carlsbad, CA 92009 Phone: (619) 929-2500 Fax: (619) 929-2555

Crowninshield Software 29 Crafts St., Suite 200 Newton, MA 02160 Phone: (617) 965-3383 Fax: (617) 965-1966

Dataware Technologies 222 Third St., Suite 3300 Cambridge, MA 02142 Phone: (617) 621-0820 Fax: (617) 621-0307

Executive Technologies 2120 16th Ave., South Birmingham, AL 35205 Phone: (205) 933-5494 Fax: (205) 930-5509

Folio 2155 North Freedom Blvd. Suite 150 Provo, Utah 84604 Phone: (801) 375-3700 Fax: (801) 374-5753

Knowledge Access Int'l 2685 Marine Way, Suite 1305 Mountain View, CA 94043 Phone: (415) 969-0606 Fax: (415) 964-2027

KnowledgeSet 888 Villa St., Suite 410 Mountain View, CA 94041 Phone: (415) 968-9888 Fax: (415) 968-9962

MicroRetrieval One Kendall Square Building 300 Cambridge, MA 02139 Phone: (617) 577-1574 Fax: (617) 577-9517

Nimbus Information Systems PO Box 7427 Charlottesville, VA 22906 Phone: (804) 985-1100 Fax: (804) 985-4625

Ntergaid 2490 Black Rock Turnpike Suite 337 Fairfield, CT 06430 Phone: (203) 380-1280 Fax: (203) 380-1465

Online Computer Systems 20251 Century Blvd. Germantown, MD 20874 Phone: (301) 601-2190 Fax: (301) 428-2903

Personal Library Software 2400 Research Blvd. Suite 350 Rockville, MD 20850 Phone: (301) 990-1155 Fax: (301) 963-9738

TextWare PO Box 3267 Park City, UT 84060 Phone: (801) 645-9600 Fax: (801) 645-9610

TMS 110 West Third St. Stillwater, OK 74076 Phone: (405) 377-0880 Fax: (405) 377-0452

Voyager 1351 Pacific Coast Highway Santa Monica, CA 90401 Phone: (310) 451-1383 Fax: (310) 394-2156

ZyLab Division of IDI 100 Lexington Dr. Buffalo Grove, Illinois 60089 Phone: (800) 544-6339, (708) 459-8000 Fax: (708) 459-8054

[TABULAR DATA OMITTED]

Compton's NewMedia: SmarTrieve

The Encyclopedia Britannica is not yet on cd-rom, but Britannica's corporate sibling, Compton's NewMedia is one of the leaders in cd-rom reference book publishing, boasting such titles as Compton's MultiMedia Encyclopedia and the Guinness Disc of Records. SmarTrieve consists of the software tools used to produce such popular and pioneering titles. Compton's NewMedia is making these authoring and retrieval modules available to other publishers seeking to repurpose print material and add multimedia elements. ESC, Jostens, DMG, EB, Context, USA Today, Dialog, Mediashare, Ingram and B. Dalton have already taken advantage of this opportunity.

SmarTrieve offers easy-to-use interfaces for the three common desktop platforms (dos, Windows and the Mac) and for the Sony portable cd-rom XA player (also known as the "MMCD" or "Bookman"). These front ends are

unusual in that they accept natural language queries such as "Why is the sky blue?" or "Do fish in the ocean sleep?" More evidently than with much of the competition, the user interfaces have been designed for the general public rather than the trained database searcher or experienced computer user.

Boolean logic and relevance ranking are implemented automatically, without a complex user query syntax. Young students use the retrieval software enthusiastically in elementary and secondary school libraries, an indication of how easy it is to learn and use. Features include links among text entries, graphics, animation, audio and digital video.

Idea, concept searching. The full-text index permits word searching, but the software also supports what Compton's claims is sophisticated idea or concept searching.

When SmarTrieve accepts a natural language query it is not, however, really parsing the English entry. It does not "understand" the question at all. When you ask SmarTrieve "Why is the sky blue?" SmarTrieve has no way to extract the linguistic structure of the question or to evaluate its "meaning." The software is oblivious, in other words, to natural language syntax and, at this point in the process, to semantics as well. What SmarTrieve does, however, is to process this query in roughly the following way:

1. It drops the stop words and concentrates on words that occur with lower frequency in the full-text index. In this example, it skips "Why is the" and looks at "sky blue."

2. It looks up "sky blue" in a concept dictionary, a hierarchical semantic network that maps related terms: synonyms, subclasses, superclasses, etc. This network has been derived from the massive Britannica reference work files, which include encyclopedias, dictionaries, thesauri and other sources.

Phrase support in the dictionary will find that "sky blue" is a phrase in English, and ask the user whether the question is about the entity "sky blue." Upon user response that this phrase is a red herring and not really of interest, the concept dictionary is consulted to find terms related to "sky" and to "blue" separately.

3. It finds documents containing "sky" or "blue" and/or any terms the concept dictionary defines as related to these ("atmosphere" and "azure" perhaps).

4. A Soundex file will also be consulted, so that a child's "Why is the sky bloo?" would also be properly processed.

5. SmarTrieve then flags the encyclopedia articles that contain references to sky, blue or related concepts, from the full-text inverted index. The index also is used to calculate in which articles the two concepts are both found (co-occurrence), how often they co-occur, how close to one another they co-occur (proximity) and just the frequency of occurrence of each term individually in each flagged article. The algorithms chugging away to weight all of these factors also take into account whether the key terms occur in the body of the text or in the title of an article, for example. A weighting is assigned to each article.

6. The articles are sorted in rank order of the relevance weighting, the titles are listed, and the user is assisted in finding out whether an article is really relevant by looking at the context in which the possibly relevant term or terms occur in the article.

The purpose of all of this computational effort is at least threefold: to find the documents that a simple full-text Boolean search (find sky and blue) would miss, to list the (potentially) most relevant articles first in order to save the user's search time, and to make the user interface much friendlier.

The retrieval engine has been designed to automate sophisticated searching rather than to achieve speed records. The indexing tools are not advanced as speed demons, either.

The software is designed for text, linked to graphics and multimedia objects. Where the retrieval platform will cooperate, font information and character attributes can be utilized, but the retrieval of text is not page oriented. Graphics and text can be shown together on the screen or viewed

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separately. Users can copy material from the disc into the clipboard for printing or incorporation into other applications.

Smartdr, the standard retrieval software, can search multiple databases across devices and over a local area network. It can also operate as a tsr under dos or as a separate Windows task, making online reference material accessible by the computer user via a hotkey without the need to exit another application.

For developers who require a custom user interface, a set of C-callable subroutines, Smart-API, is available.

An enhancement to SmarTrieve planned for introduction this month will add a Virtual Workspace capability. The virtual workspace, similar in concept to Xerox Rooms, enables numerous articles or documents to remain open simultaneously without being limited to the desktop space on a Windows screen. The user can move in and out of SmartTrieve and return immediately to a stored setup at a later date.

R.R. Donnelley's Database Technology Services Division is providing SmarTrieve authoring services for Compton's NewMedia and for other publishers not wishing to bring indexing and data conversion in-house yet. Donnelley's DTS group will also provide data-preparation services using a number of the other authoring tools mentioned in this article. DTS claims to be "like Switzerland," neutral in the battles among the authoring software giants. Compton's, headquartered near San Diego, also distributes third-party cd-rom and floppy-based titles as well as its own works.

Summary. SmarTrieve's strengths are its easy-to-use interface, including the capability to accept and process (but not parse) queries in natural language, its sophisticated relevance ranking algorithms based on both statistical and semantic approaches, its capability to link text with graphics and multimedia objects for cd-rom reference titles and catalogs, and its support for Mac, dos, Windows and Sony MMCD retrieval. A weakness may be retrieval speed, due to the search for conceptually related material rather than simple string searching.

Crowninshield: MediaBase

Crowninshield, located in Newton, MA, is one of the smallest authoring software vendors, but more than 50 different cd-rom titles have been published with its software, MediaBase, which has been in use since 1988. Some commercial publishing applications include The Hutchinson Encyclopedia, The Colorado Revised Statutes, ArtFacts, The Aircraft Encyclopedia, Vietnam Remembered, The Plant Doctor, The Baseball Register and The Massachusetts Administrative Law Library. Corporate and academic customers include Ocean Spray Cranberries, Raytheon, The Social Law Library, University of Colorado, University of Iowa and cd-rom Resource Group.

Different flavors. Crowninshield's MediaBase's full-text retrieval package organizes text records and associated color or monochrome graphics and multimedia files into an outline-structured database, with categories and subcategories. Records can have specific fields containing numeric or alphanumeric information contained within them. The outline is an organizer for both the author and the user. The logical structure of a document or collection of documents can be mapped into the MediaBase outline, and the user can constrain searches to a particular level of the outline. The typical title is directed at a general interest audience, pulling together a variety of information on a given topic.

MediaBase offers three standard full-text retrieval interfaces:

1. MediaBase Light for dos, a function-key driven front end for novice users with the stress on simplicity;

2. MediaBase Runtime, also for dos, with pulldown menus, Boolean searches, cross-category searches, notetaking and database extraction tools, record marking, recording of search "trails"; and

3. MediaBase Windows, a Windows-based product that features a graphical user interface and presents outline and record headings as well as a scrolling word wheel. Fielded Boolean searches can be initiated via mouse clicks, and hyperlinks cross datafiles or categories, pointing to record headings. A mouse click orders up the display of the desired related text record or image. Windows discs can access cd-audio on mixed mode

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discs, as well as wav audio files.

For additional customization, a Developer's Package adds an api function library to the basic Publisher's Package. These subroutines can be called by a custom user interface, programmed by the developer or by Crowninshield.

Indexing/retrieval. Authoring consists of designing the outline structure and placing field and record delimiters within a stream of text. Drop-down menus in the Editor or Outline Utility program guide the author in importing and then indexing the data. After importing and indexing, it is possible to rearrange the outline and the field orders, as well as to make spot corrections to the data.

For the authoring process, Crowninshield estimates indexing speed of about 20 mb per hour (with a 15-ms average access hard disk) and an index overhead of 30 to 40% of datafile size. During actual indexing you will need four times the size of the import file available on the hard disk for temporary files.

Crowninshield claims that most searches on a MediaBase cd-rom title can be completed within a second or two, even on low-end machines.

All of these figures are so typical of the industry's claims that we will mention competitive figures only when they deviate significantly from these.

Premastering. Crowninshield also supplies premastering software, called the CD-Formatter, which, like other premastering programs, can output iso 9660 formatted image files to 8mm tape, digital audio tape, 9-track tape, or recordable cds and other removable media. CD-Formatter is bundled with the Publisher's Package.

Summary. There are people who organize anything into a hierarchical outline, from a shopping list to a lecture, and there are those who find outlines obnoxious. MediaBase is a tool for the outliners. It turns out that this structure can be congenial to the development of a wide variety of titles, particularly reference materials.

Dataware: CD Author, Reference Set

Dataware Technologies claims to be "the largest and most complete independent supplier of software and services to the cd-rom and multimedia industry," employing 90 professionals worldwide. Founded in 1988, Dataware merged with Reference Technology earlier this year. The new company retained the Dataware Technologies name and Cambridge, MA, headquarters. Prior to the merger, Dataware had been known for its fielded-data authoring products, which had done well in the commercial publishing market, while Reference Technologies was known for its full-text products and its success in the government and corporate cd-rom data preparation niches.

Dataware cd-rom authoring software has been used to prepare more than 300 titles including: * National and regional postal and telephone directories, including discs by American Business Lists, the British Post Office, Deutsche Postreklame (Germany), Nynex Information Technologies, ProCD, Read Only Memory (Australia), the Swedish Post Office and U.S. West Communications. Dataware itself, together with SpeedDial, publishes American Business Information, a Yellow Pages directory of the U.S. * In-house corporate products for companies such as A.M. Best, Eastman Kodak, Dun & Bradstreet, Siemens and 3M. * Standards and patent information for AFNOR (France), DIN (Germany), the British Standards Institute, the European Patent Office, Research Publications, the Spanish Patent Office, the U.S. Patent Office and WILA Verlag (Germany). * Catalogs, indexes and reference titles for universities in several countries and for clients such as Baker & Taylor Books, the Association for Computing Machinery, Datapro, IDG, National Information Services, R.L. Polk and Thomson Financial Publishing. * Company information discs and business directories for TRW Business Credit and others. * Technical documentation and parts catalogs for R.R. Donnelley, Ford New Holland, NEC (USA) and others. * Legal information cd-roms by publishers in Germany, Spain and Belgium. * Discs containing newspapers and periodicals by Newsbank, Softline Information, Inc., and several Canadian publishers. *

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Government information from Canadian, Dutch, Italian, French and Swedish agencies, plus, among other American agencies, the U.S Geological Survey, the U.S. Information Agency and the U.S. Navy. * Time-series databases on cd-rom from the Bank of America,

International Monetary Fund, World Bank, Quick Source and the Canadian National Statistical Agency.

As a result of the merger with Reference Technology, Dataware now offers four authoring packages. The former Reference Technology products are denoted the ReferenceSet product family, which includes the text-oriented Full Text Build/Text ReferenceBook and the structured data-oriented Key Record Build/Record ReferenceBook. The two original Dataware products are in the CD Author family: the structured/fielded data-oriented CD Author/CD Answer and the text-oriented CD Author HyperText/CD Answer HyperText. There seems to be considerable overlapping in functionality between the two text-oriented packages and between the two structured-record packages.

Dataware presents itself as a complete service bureau and a software vendor, capable of handling the software customization data preparation, and premastering if the client so desires. Dataware also sells a premastering module called CD-Prepare.

CD Author/CD Answer

CD Author build software and CD Answer retrieval software are used for structured, fielded-data titles, such as indexes, catalogs, directories, patents, bibliographies, corporate customer data, statements, parts inventories and government accounting data.

CD Author/CD Answer is known for searching large fielded databases (several hundred megabytes on one disc) rapidly and effectively. It can process 16 million records of 512k bytes each, each record containing up to 2,047 fields.

CD Author/CD Answer also has advantages in the following areas: * Foreign language support (user interfaces for 13 European languages plus Japanese Kanji); * Cross-platform authoring and retrieval, with the same cd-rom disc (containing multiple user interfaces but only one set of data and indexes) usable on dos, Windows, Japanese dos/V, Mac and Unix environments. The same database, but not the same disc, can also be used on cd-i players. * Data compression, with the finished application, including the indexes, often requiring less space than the uncompressed source data;

* Encryption;
* Advanced full-text search capabilities such as adjacency and proximity; * Flexibility of indexing (for example: phonetic "sounds-like" index; many different possible formats for date fields);
* Output options (for example, export records in dBase format);
* Capability to link raster page images or pictures to structured records; and * Multimedia files linked to fielded data and played by launching external programs.

CD Author/CD Answer text data is full-text indexed, as text, with all words except stop words, or by line, with each field indexed as a unit. The user may jump to related records by cross reference search. Boolean searches within and across fields, range constraints, various record views, and graphic zoom, pan, scale, print are supported.

Dataware provides interactive debugging of data conversion, permitting the author to step through the data reading pass a field or record at a time.

Dataware provides a wide range of customization options for CD Author/CD Answer, some of them available to those who use the standard CD Answer user interface, and others involving an api approach, available in Dataware's Advanced Design Library, or modification of the CD Answer code.

Summary. This is a package for fielded data, with a high-performance database engine, advanced support for foreign languages, cross-platform development, multiple data types, data compression and encryption.

CD Author HyperText and CD Answer HyperText

CD Author HyperText (build software) and CD Answer HyperText

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(retrieval software) is Dataware's complementary product designed for free-text applications, such as technical manuals, and standards that can be defined as a collection of documents: legal/tax information, looseleaf publications, corporate contracts, government procedures, regulations and other reference works.

This Dataware package can use sgml tagging in a source file to create a logical structure within the cd-rom. The logical structure aids navigation and searching.

Searches in CD Answer HyperText do not attempt fancy concept mapping or complex relevance ranking, except for counting the number of "hits" at each logical level. Searching and navigating in CD Answer HyperText rely on elegant electronic elaboration and combination of the traditional methods of locating information in a book, such as the expandable/collapsible table of contents representing logical structure, the (full-text) index, and pre-embedded hyperlinks that automate navigating to and from footnotes, citations, glossaries, illustrations and cross-references.

As in its CD Answer fielded-data product, Dataware stresses search speed and data capacity (up to 16 million sentences) as one of its strong points, as well as graphics display and printing, links to multimedia elements and support for 13 European languages.

In addition to text search and navigation, CD Answer HyperText includes full-data searching capabilities as described in the previously mentioned CD Answer.

Unlike the fielded data product, CD Author/Answer HyperText is only available as a dos program. Fonts and character attributes are not stored, but color may be used in the retrieval user interface. The original pages can be scanned and viewed as raster files attached to text files. Graphics are displayed and printed separately from text, not combined on the screen, except in the case of the bitmapped scanned pages just mentioned.

Customization of the CD Answer HyperText application occurs as the author specifies which fields are to be displayed on which screens. The command structure, function-key mapping etc. are not modifiable.

Summary. Use of sgml tagging to represent logical structure of text documents: used for collection of documents, technical manuals, legal codes.

Full Text Build and Text ReferenceBook

Dataware ReferenceSet Full Text Build can author text-oriented titles on a dos pc that are usable either on dos pcs or on Macintoshes. Text ReferenceBook is the retrieval software. Dataware positions these products as useful for technical manuals, encyclopedias, legal and financial publications, catalogs, policy and procedure manuals.

Full Text Build can index 16 million documents in a collection, each with a maximum size of 16 megabytes. An unlimited number of collections may be indexed and collections may span cd-rom disc volumes.

Still images can be incorporated into Text ReferenceBook titles by using the optional ImageBuild and ImageDisplay modules which permit capture, compression, indexing, storing, retrieving and displaying of images.

Like its Dataware full-text stablemate, CD Author/Answer HyperText, the Full Text Build/Text ReferenceBook combination can accept and process sgml-tagged documents. Three basic navigation techniques are supported: browsing through the table of contents and hyperlinks; text searching; and, in the dos environment, bookmark navigation. The Text ReferenceBook user interface gives the user fill-in templates for constructing search queries, and data displays for showing search results. The user may directly browse in the table of contents or document hierarchy built from the sgml markup, expanding and contracting the table fully, down to the level of the actual text content in each section indicated by the toc outline.

A word wheel of indexed terms displays all the unique words in the document collection, with frequency counts, i.e. number of documents and number of occurrences. A thesaurus permits expanding a search to include synonyms and suffixes. Bookmarks can be placed anywhere, and documents or sections they correspond to may be selected later on.

The author can select to configure the dos retrieval interface with

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either pulldown menus, function key operation, or "hot spots." The author can also modify the control flow, screen contents, function-key operation and text display. Menus, for example are modifiable in the configuration editor. An api is not available.

The Text Configure tool set can be used to design dos windows, buttons, color attributes and so forth. Macintosh environments are configured by modifying resource files with the Macintosh utilities ResEdit and ViewEdit.

The authoring process includes scanning source data for sgml tags, full-text indexing, table of contents building, and index builds for hyperlinks to images and other content. Inconsistencies in the input file sgml tagging are flagged for revision.

Summary. Full Text Build/Text ReferenceBook forms a powerful dos/Mac full-text retrieval package that can use logical document structure, hyperlinks, and a thesaurus for navigation and search. The capacity and performance of this full-text package, complements Dataware's high-performance CD Author/CD Answer package for structured data, and was one of the main inducements for Dataware to bring Reference Technology under its roof.

Key Record Build, Record ReferenceBook

The Record ReferenceBook and its build module, Key Record Build, are designed for fielded data and are suited to applications such as directories, catalogs and bibliographic indexes, much as the CD Answer/CD Author package.

The Key/Record combination, however, is strictly a dos product, unlike the wide multiple-platform support of CD Author/Answer. Record ReferenceBook has been designed to cope with very large databases: up to 2 billion records with up to 32,000 fields per record, each of which can be indexed (given enough time and disk space). Images can be linked, as in the Full Text/Text ReferenceBook product described above.

Building a cd-rom title with Key Record Build includes defining the data structure, revising the files for consistency, indexing and optionally compressing and encrypting the files. With compression, the data files plus indexes can take up less disk space than the original source data.

Executive Technologies: Search Express

Search Express is dos or Windows full-text search software designed for collections of documents and related raster images. The documents can also be linked to multimedia files, but the audio player software or video viewer software would be external to Search Express.

Search Express was developed specifically for slow optical disc drives and has been refined since 1984. More than 1,000 companies have bought Search Express, using it on all kinds of media. More than 20 cd-rom titles have been pressed, by organizations such as the Environmental Protection Agency, the U.S. Government Printing Office, Darby Printing, Ingersoll-Rand, Wall Street Transcript, University of Alaska, Borden and A.R.E.

Relevance ranking. Search Express has its own version of relevance ranking. The central mission of the Search Express retrieval module is to find documents containing one or more of the multiple terms that a user believes might be relevant to a search, and to rank the documents in a probable order of relevance. To initiate this process, the user manually assigns a numerical weight to each search term in a list. The software finds all documents containing any of the terms and ranks them by first multiplying the word weight assigned to each word by the number of occurrences of that search term in a document. Then these products are summed to generate a document weight, which can then be ranked against other documents.

When the ranking is complete, the user is invited to select a likely document header from the ranked list and zoom down into the document, then the paragraph and then the sentence that contains one or more search terms. The found words are highlighted by the program.

Boolean searches, with proximity parameters, can also be performed. Automatic word rooting looks for variants of a word: plurals, past tense,

etc.

Text documents can contain any of the 256 ascii characters, but font and character attribute information is stripped. Fields may be defined containing alphanumeric, date or numeric data. Range searches may be executed on the numeric and date fields.

Users can print and export data, but the author can limit these features. Encryption is an option.

Graphics, links. Line-level hypertext can link a line in the text and a graphic: "See Figure A" can trigger the image, Figure A. Ad hoc hypertext searches can also be performed: The user highlights a word or phrase in a document. Search Express finds and lists the headers of other documents with that key term in them. The user can then view these "related" documents and escape back to the original document when finished.

A multilevel table of contents can be supplied to assist the user in navigating through a structured collection of documents, such as a manual.

Non-English retrieval interfaces and other modifications of the Search Express retrieval programs can be made by writing custom code with calls to the Search Express api.

Search Express build modules can automatically index document files, extracting the title from the top of a document, for example. Search Express has its own markup language that can be employed to convert input files to Search Express format.

Folio: Views, VIP, PreViews

Folio Corporation has two dos-only, cd-rom free-form text-oriented authoring packages, Folio Views version 2.1 for non-commercial projects (with Folio Personal Edition or Folio Runtime retrieval software) and version 2.5 for commercial (for-profit) publishing, mated with Folio VIP (Views Infobase Personalizer) or Folio PreViews retrieval software.

This month, Folio announced version 3.0 of its Views software. The new version will be available for Windows, dos, and, eventually Macintoshes. Our profile here is based on Version 2.1. A news story on the forthcoming release is in the Latest Word section at the back of this issue.

Folio calls collections of free-form documents "infobases." It sees the task of its Views software as managing infobases: searching, grouping, linking, editing, annotating and printing information from collections of electronically stored documents.

Folio, founded in 1986, is privately held and based in Provo, Utah. Folio saw its market as "personal electronic publishing" software for corporate or in-house electronic publishing, "bridging the gap" between desktop paper-based publishing and commercial electronic publishing via on-line services or

cd-rom.

Folio Views was introduced to the market in 1989. The line between in-house and commercial applications became blurred as Folio pursued a strategy of licensing its retrieval software to the largest possible installed base. Folio claims that its Views retrieval software for accessing its infobase format is now licensed to be used by more than 20 million people. This wide availability of the Folio reader made authoring in the Views infobase format an attractive option for commercial infobase titles as well as in-house document databases. Folio tools have been used in vertical niches such as legal, accounting, insurance and government.

Folio Views 3.0, released in 1990, added cd-rom support, hypertext linking, multiple database access and links to other applications.

Customers. Folio "infobase" electronic publishing software gained wide exposure by being bundled with every copy of Novell's Netware lan operating system as the retrieval software for the Netware Help utility. Novell subsequently published the Network Support Encyclopedia, a collection of Netware documentation on cd-rom, using Folio software. The Novell Netware Help version of Folio's software can also be used to retrieve data from infobases other than Novell's online documentation. These infobases can be created with Folio Views, which is not part of Novell's retrieve-only Folio software.

(For those interested in riding on whatever Novell does, Novell expects to move next year away from Folio to an sgml-based viewer for its

documentation library.)

Folio software is used by Chase Manhattan Bank, Union Carbide, the U.S. Army and the Internal Revenue Service. Publishers using Folio software for electronic publishing (on magnetic media and cd-rom) include Prentice-Hall, Thomson International, the American Institute of Certified Public Accountants (AICPA), the Financial Accounting Standards Board, and Mead Data Central (The Michie Company). A recent Folio list shows 64 different infobase publishers using Folio software. Commercial publishers are served by Folio's Publisher Division, set up last year.

Building an infobase. The building blocks of a Folio infobase are paragraph-size blocks of text called folios. Searches find folios, and links connect folios, whether within one infobase or between infobases, even across networks. Boolean searching and proximity parameters aid finding relevant folios, but there is no form of concept searching or relevance ranking. Fielded data is not supported.

Authoring in Views follows these steps:

1. Filter input files into Folio Flat File formatting and coding, stripping or translating original control codes.
2. Segment the text into folios, logical blocks.
3. Add a header to each folio.
4. Group folios into topics and hierarchies. A folio can be a member of more than one group.
5. Link related sections of information, as in cross-references, footnotes, tables of contents or external programs.
6. Create the infobase from the Folio Flat File.

There are numerous software tools in the Views package to accomplish aspects of these procedures and provide quality control.

Folio Views supports all extended ascii characters and preserves bold, underline, bold-underline, center, justification, tabs and column codes. Text is not displayed as pages and graphics are not viewable simultaneously with text.

Except for a pcx viewer and an rs (RealSound) audio player contained within Views retrieval software, Views displays/plays nontext data by launching external dos programs via "hot links."

Retrieval. The Folio Views retrieval engine is the same for magnetic and cd-rom applications, but it has been optimized to minimize seek operations on the part of the drive mechanism in either case.

Folio Views can significantly compress text files. Folio, in fact, claims to be able to reduce the text and index of an infobase into a single file that is half the size of the original datafile size alone. This negative overhead has been tagged "Underhead Technology" by Folio's marketing folks. Because of this extremely efficient compression, Folio does not bother to create a stop list of high-frequency words that are usually dropped from full-text indexes.

The user interface is Folio's own windowing environment. To search, users select words from a word wheel window, construct a query in the query window, and see the resulting number of hits in the results window change interactively as the query is refined.

The interface is not customizable, beyond such matters as controlling the size and position of windows and being able to select the color scheme, but versions of the product are available in German, French and English.

Summary. Folio's approach to text data has the limitation of being based on small blocks of text and of lacking state-of-the art support for typography, relevance ranking, concept searching or document structure tags. The data model and user interface have worked, however, for numerous titles that can conform to the Folio constraints.

Knowledge Access: KAware

Knowledge Access International is a cd-rom and electronic database publisher that decided to make its own publishing tools, known as KAware, available to the industry in the late 1980s. This was important, historically, because the KAware build packages were among the first to be offered at aggressively low-purchase or first-title prices. KAware moved the price of entry at least one and in some cases even two decimal places to the left, but of the mainframe range into the domain of other desktop

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software.

Even though the KAware authoring license is coupled with a runtime per-disc royalty, the removal of the initial price barrier unquestionably enticed a number of commercial and corporate in-house publishers to take the plunge into what was a new medium, with titles like Gale's Global Access Associations (the Encyclopedia of Associations on disc) and the American Library Association's Directory of Library and Information Professionals. In fact, Knowledge Access claims it is third among retrieval software vendors in the number of commercially available titles using its software, behind the cd-rom publisher SilverPlatter, and Dataware.

Knowledge Access, founded in 1983, has eight employees plus contract programmers. The major applications for KAware on cd-rom have been directories, bibliographic databases and full-text document collections.

KAware's cd-rom authoring customers include the U.S. Government Printing Office, the World Bank, the University of California, Electric Power Research Institute, UPS, Thomas Publishing, Nabisco, Merck & Company, Bristol-Meyers, NOAA, Naval Air Development Center, the Food & Drug Administration, Defense Technical Information Center and many others.

Packages. KAware has separate ms-dos cd-rom build/retrieve packages for fielded data and for free text. Either one may be enhanced by an image module that supports linking raster color and monochrome graphics (tiff and pcx) to text documents or fielded records. KAware Fielded and KAware Full-Text user interfaces share about 90% of their commands. There is one standard retrieval interface for KAware Fielded and two standard interfaces for Kaware Full-Text, including the new Quick Search (Search... See... Print) user interface intended to be less intimidating for novices.

A Windows version of the Kaware products is anticipated in the first quarter of 1993. The Windows version of the retrieval system is being written for cross-platform porting to Unix machines and the Macintosh.

In the full-text product, basic text-search functionality is present: word search, phrase search, proximity search, Boolean operations, wildcard and truncation search, menu search, and hyperlinks to images and predefined or ad hoc related text.

The full-text Kaware Disk Publisher build package requires the input files to be stripped of word processing and typesetting formatting into plain ascii. A Kaware markup scheme is then used for fields, table of contents and hypertext links, as supported in the full-text system. Conversion modules process sgml and other coding schemes to translate the codes that have an impact on searching or screen appearance.

Foreign character sets and other upper-ascii characters are evaluated for availability and location in the alphabetical sorting sequence. The full-text product is available with interface support for French, Spanish and English.

An example of the multilingual capabilities is the forthcoming Compact International Agricultural Research Library (CIARL), a 17-disc cd-rom set that uses trilingual KAware Full-Text/Image retrieval software. Distributed by the Consultative Group on International Agricultural Research in Washington, DC, the set is an international compilation of 200,000 pages and 30,000 monochrome and color images.

Fielded KAware Disk Publisher requires the input files to be in comma-delimited format. A conversion program is supplied to convert from left-tagged to comma-delimited format, if necessary. Fields can be defined as containing one of 16 different data types, and can be searched within user-specified ranges. Records can be sorted for display and printing. Subsets of the database can be defined and selected for output or searching, and the set definitions can be saved. A typical KAware/Fielded title is the Harris Selectory, 1993 National and Regional Manufacturers Directories on Disc, available on cd-rom and on floppy disks.

In addition to the KAware Disk Publisher and KAware retrieval software, Knowledge Access sells a cd-rom premastering and simulation system. As do most current premastering systems, the KAware one can now write an "authored" application into iso 9660 format and onto a recordable cd on a write-once cd drive, where the disc can be used for in-house prototyping or low-volume distribution.

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KAware's seminar workbook, Publish on Disk gives prospective KAware authors an excellent idea of the issues involved in using KAware, or other cd-rom authoring packages. Some of the content will, of course, have to be updated when the gui versions of the product become available.

Summary. Knowledge Access has provided two authoring systems (for text and fielded data) that between them aim to accommodate much of the character-based and graphics data published on cd-rom. With the development of a gui version under way, the user interface, which has the flavor of older online library database products, is presumably being made more appealing to users who are not information retrieval professionals. The provision of a simple QuickSearch interface option for the text-oriented product was an earlier step in this direction.

KnowledgeSet: Knowledge Retrieval System, DeskTop DataPrep (DTDP)

KnowledgeSet offers DeskTop DataPrep (DTDP) authoring tools, Knowledge Retrieval System (KRS) retrieval software, and KRSAPI, an application interface that permits custom-developing a user retrieval shell.

KRS and DTDP software is designed to prepare and deliver cd-rom-based technical documentation, proceedings of technical conferences, catalogs and context-sensitive help systems across a wide range of delivery platforms: dos, Mac and Unix, with authoring on a Sun Sparc Unix workstation or a '386 dos pc.

Because of its support for cad/cam graphics formats and tech-doc work in general, KnowledgeSet is the kind of software that might be used to produce cd-rom maintenance manuals for jetliners, for example.

KnowledgeSet is a text-and-graphics package, with multimedia audio and video accessed only through external calls. The text and graphics support is designed around the tech-doc emphasis. Raster formats ccitt Group 3 and 4 plus dib are supported, but also vector graphic formats cgm, vdi and pict, useful for technical drawings. The files can be encrypted for security or to protect copyrighted data. Hyperlinks from points in graphics are not yet supported, but are planned.

European and Asian character sets are supported. Fonts and character attributes are preserved. Straight ascii text can be directly input prior to markup; rtf, Frame, Interleaf and sgml can be filtered. Full support for sgml will be available in 1993. PostScript support is planned, but at present pages are not represented as such.

Graphics and text can be viewed together or separately, depending on the platform. Searches can be done across multiple documents on multiple databases. Relevance ranking is determined by number of matches within a document. A dictionary is provided to identify terms in the database and ensure proper spelling. Proximity and Boolean searches are supported.

Some Hyperlinks are pre-indexed, such as references, citations and a table of contents outline. Linked lists of articles resulting from a search, history and path lists, notes and bookmarks are created on the fly and can be saved.

Searches can be limited to identified fields: headings only, text, footnotes, bibliography, etc. Within the fields supported in the text documents, Boolean searches within and across fields are supported, but range searching for dates and numbers is not.

The user interfaces feature pulldown menus for experts, buttons for the casual user. Navigation aids include citations, references, outlines, bookmarks, notes, history files, path files and save queries. Non-English versions of the user interface can easily be created.

Summary. This package has been optimized for technical documentation. Support for typography and graphics, including vector graphics file formats, is good and getting better, with full sgml and PostScript support planned.

MicroRetrieval: Re:Search

MicroRetrieval is a new company that in 1992 purchased the assets of Retrieval Technologies, the firm that developed Re:Search, an ms-dos full-text and image cd-rom data preparation and retrieval package.

MicroRetrieval's Re:Search Search Module is organized around "catalogs" of text documents and images. Page breaks in the text and text page formatting can be preserved, along with character attributes, but not

fonts. Fielded records may be defined, with fields supporting date, numeric and text data.

Full text searches can yield a "relevancy ranked" list of documents. The relevance ranking is based on a simple frequency count of "hits" in a given document. The listing of documents can be toggled between a relevance-ranked sort and an alphabetical sort.

Hyperlinks will be supported at the beginning of 1993: word to word, phrase to phrase, and from images to text and text to images.

Red Book Audio (cd digital audio) may be linked to a text or image line and searched on by description tag. Motion video will be supported in the forthcoming Windows product.

An api toolkit is available for customizing the user front end.

The dos Build Module allows the developer to:

* Create a hierarchy of documents;
* Tag images, audio and fields;
* Title text files;
* Create paths;
* Modify the stop list; and
* Index.

Retrieval Technolgies' zero-runtime-royalty pricing of Re:Search retrieval software, continued by MicroRetrieval, is probably one of the factors in the use of Re:Search by a number of government agencies, organizations, publishers and corporate clients: The Joint Chiefs of Staff, the U.S. Department of Agriculture, the IEEE (for conference papers), American Insights (technology and patent information), Wm. C. Brown Publishers (Multimedia College Biology Textbook on Cd-rom), Coopers & Lybrand (resumes), Cotton Incorporated (Textiles and Patterns), Fidelity Investments (marketing articles) and others.

A Windows version of both the build and retrieval modules is expected in the first quarter of 1993. The Windows program will support 24-bit color images and will also have a version that complies with the cd-rxx standard for distributing data on cd-rom that is decoupled from a particular user interface.

Summary. Re:Search is designed to find documents relevant to search criteria, using defined fields and free text, and to display image as well as character data. Its pricing, with zero runtime royalties, differentiates it from other packages more than its features, though its straightforward user interface also makes it appealing.

Nimbus Information Systems: Romware

How did a British audiophile record company spawn a cd-rom authoring package marketed from Virginia? It went something like this: producing analog lp records of highest quality led to manufacturing audio compact discs. Hop across the "pond" and set up a cd plant near Charlottesville. From cd production, why not cd-rom? Set up a cd-rom division. To support and encourage cd-rom publishers, develop authoring tools. There you are, in an antebellum farmhouse in Ruckersville, VA, next to a cd factory. The authoring and retrieval software, called Romware, and the Nimbus replication facility's production services are sold separately. One can be used without the other.

Romware is another zero-runtime-royalty product, one of the first to be priced with that flexibility. Romware accepts and searches free-form text, can store information about its logical structure (toc, etc.), and also permits definition and manipulation of structured records with defined fields. As the Nimbus product sheet says, "Not all database management systems can work best with all types of data. But Romware is designed to work with all of your data."

Electronic publishers can prepare data with the Romware Database Build and Indexing System, and put the Romware DBServ Retrieval Engine for dos and Windows on the discs. If they like the standard user interface, RW30, they can put that on the disc, too. If not, Nimbus might have another user interface on the shelf, since several have been developed. If not, the cd-rom developers can program their own "client" interface that can communicate (via Romware's query language) with the Romware database server software.

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Romware retrieval software was designed to run directly from the cd-rom, without using space for temporary files, index files, or the retrieval modules themselves on the hard disk. It was also written to run acceptably on ancient pcs, though of course it likes faster machines, more memory and contemporary display technology.

Romware fields in structured records can be defined text, numeric or date. Text fields can be indexed by word or by the whole entry. Dates can be entered in one of 11 formats. Free-form text documents can flow the text with word wrap or preserve the author's line breaks. Graphics are stored in pcx and uncompressed tiff graphics files, audio as Red Book audio.

Full-text indexing is possible, using a stopword list that can be modified by the author. Relevance ranking and fuzzy logic are not supported. Word stemming is enabled, however, and proximity searches can be processed at the word, sentence or paragraph level by the database server, i.e., the retrieval engine, but not yet with the Standard Interface (RW30). Complex Boolean searching, including nesting and set operations, is supported -- for those who can keep track of parentheses.

Fielded data can be searched by Boolean queries, too, and data in a search set may be sorted on up to nine fields. Multi-valued fields permit subentries.

On-the-fly "hypersearches" can be performed to find and display other records containing the same terms as the original record, in the same fields. Less constrained searches for related material can look in other fields as well.

The author can modify RW30 function keys and menu options within the standard interface and standard authoring tools.

Some of Romware's other features: multilingual support, encryption, data compression, import utilities that can read dBase III.dbf files or fixed-length record files and selection among ten user-defined character sets in any one field.

Nimbus publishes a periodically revised demo cd-rom called Romware Magazine. A recent "issue" contains a movie database with more than 1,700 film entries, a cd-rom product catalog, a database of responses to opinion polls, a portion of the National Trade Data Bank, some (unclassified) Army Logistics inventory data, an example of a Romware textbook interface, Bookface (from the Life and Work of Sir Isaac Newton), and some programming and cd-rom utilities. The variety of sample material is designed to invite evaluation of the search engine and to give prospective authors a look at different interface possibilities, beyond RW30. The film database, for example, can be viewed with either a dos or Windows Romware user interface.

Summary. Romware, another package with no per-disc royalty fees (although there are per-title fees for the build tools), can be used well for reference works that are composed of structured records, searchable text and pictures. Romware runs from the cd-rom drive alone; the retrieval database server has been designed to accept multiple user interfaces.

Ntergaid: HyperWriter/HyperReader

Ntergaid was founded in 1987 to develop hypertext authoring tools. Based in Fairfield, CT, Ntergaid has ten employees. Its first product was called Black Magic.

Remembering Ntergaid's product names is easy: HyperWriter is the data preparation software; HyperReader is the retrieval software. HyperWriter-based cd-roms include the 1991 and 1992 Microsoft Cd-rom Show discs and the PC SIG Cd-rom Compendium, 11th Edition. Someone obviously thinks that HyperWriter/HyperReader, more commonly used on magnetic media and over networks, is a serious cd-rom data preparation and retrieval software contender.

In addition to HyperWriter/HyperReader and related software, Ntergaid offers HyperWriter for Training, an authoring tool for computer-based training that adds testing, grading, reporting and student management to HyperWriter hypermedia authoring package.

Ntergaid's packages are graphical, object-oriented programs that make some of the other cd-rom retrieval and authoring tools seem dated. HyperWriter applications can involve large quantities of text data, plus, as required, graphics, audio, video, and animation. Text can appear in

scrolling or card form, both within the same document if desired. A "document" can in theory be up to 136 gigabytes.

Hyperlinks can lead to text, to graphics and to actions, including "spawning" external applications and device controllers. Links can be bidirectional. Links can lead from any area of a graphic image and can lead to "attributes" assigned to text, such as author, date created and access rights. Links can lead to information in a pop-up window. Multi-level documents can be created, serving users with differing needs or backgrounds.

The authoring tools for both plain dos and Windows permit the creation of a user interface to fit the application, with multiple windows, buttons, control panels, graphics and menus. In both dos and Windows, stylesheets can specify text fonts, colors, justification and positioning.

Navigation tools include graphical mapping of the "document," bookmarking, infinite retrace, full-text indexing and standard Boolean searching.

HyperWriter directly imports ascii, WordPerfect, and Ventura tagged text. The recently released HyperWriter AutoLinker module converts, in addition, Microsoft Word for ms-dos, Ventura Publisher Markup, PageMaker Markup, and a limited subset of sgml markup. One of the AutoLinker tools is the language HyperAwk, which can be used for creating HyperReader-compatible documents and links from source documents. Some HyperAwk code can be generated automatically by an automated programming facility within AutoLinker. Ntergaid claims that the AutoLinker tools for converting large quantities of text files into HyperWriter/Reader format and indexing them will make the wider use of Ntergaid's software for databases of cd-rom scale much more feasible.

The HyperWriter developer's kit sells for $1,595. Note: there are no per-title or per-unit royalty fees for titles published with HyperWriter and distributed with HyperReader. Furthermore, HyperWriter creates cross-platform compatible dos and Windows hypermedia titles. Both dos and Windows retrieval software can be placed on the same disc, with a single set of data files. Mac and Unix retrieval packages are planned for delivery later this year.

Summary. The Ntergaid authoring system supports almost every imaginable kind of hyperlink among text elements and related information. It would be useful for manuals, catalogs, encyclopedias -- any title with complex cross-referencing. Its up-to-date and customizable user interface, multimedia support and text file conversion utilities, combined with its aggressive pricing, earn it at least a look for almost any title.

Online Computer Systems: Opti-Ware

Online Computer Systems was founded in 1979 to help corporations and government agencies master the electronic delivery of information. Currently there are more than 100 employees. Hundreds of cd-rom titles have been developed with the Opti-Ware tools, and nearly 200,000 copies of the Opti-Ware retrieval software have been distributed. But don't look for a copy of Opti-Ware authoring tools on the shelves of your neighborhood Egghead store.

Online's Opti-Ware is a powerful set of tools for creating and retrieving cd-rom titles. But it is not a commercial package for the do-it-yourselfer. The Opti-Ware tool set in reality is not a packaged "authoring system." What Online does for clients wishing to "author" their own titles is to custom design the authoring system, selecting the relevant user interface and subset of data preparation tools for a particular customer and application.

The authoring platforms are Vax/vms, Unix systems, or IBM mainframes under mvs. The delivery platforms include dos, Windows, os/2 PM, Mac and Unix/X Window.

As the price chart shows, this service carries a major-league price tag, but it can produce major-league products: * Bibliographic and other fielded-data reference products such as

Bowker's Books in Print, Variety's Video, or the Library of Congress CD-Marc/Names, which contains millions of records); * Technical documentation systems, such as GTE maintenance documentation; * Multimedia

encyclopedias and other full-text products, such as Grolier's Multimedia Encyclopedia, Scientific American Medicine; and * Illustrated parts and products catalogs, such as the Whirlpool parts catalog, or the Cahners Computer-Aided Product Selection System (CAPS), which spans 47 cd-rom discs. (Opti-Ware permits cd-rom databases to be distributed over multiple drives and jukeboxes.)

Robust product. Online can deal with an extremely wide range of text, graphics and multimedia formats, non-English character sets, page description languages, compression standards, encryption options, etc.

Retrieval features include full-text search, proximity searching, Boolean searching and user-definable thesauri. Hyperlinks, both preindexed and user-generated on-the-fly, are supported. Retrieval software can use the logical hierarchy of a document for navigation and searching. Opti-Ware also supports Boolean searches through fielded data and range searches through numeric data.

Opti-Ware has developed special graphic features for applications such as parts catalogs, where exploded-view diagrams are linked to parts-list text data. A part number can be exported to an external application from the catalog page. Multimedia elements are linked to specific text sections, but their indexes can be separately browsed or searched.

Summary. Not really one packaged product, Opti-Ware is a large family of authoring tools and retrieval routines from which Online selects to create an authoring system for a given title and client. There are few platforms, file formats or varieties of data for which Online doesn't already have software, but the software and Online's expertise don't come cheap, and the authoring stations require more powerful hardware than a pc or a Mac.

Personal Library Software:

Personal Librarian

Personal Library Software, headquartered in Rockville, MD, was founded in 1983 to bring to market full-text document management and electronic publishing technologies that were emerging from university-based research, such as that of PLS founder Matthew B. Koll. The first product was SIRE, a full-text retrieval product using Koll's search heuristics that ran on pc, Vax and Unix platforms. SIRE was the direct ancestor of Personal Librarian, which was introduced in 1986. Personal Librarian became one of the first Windows packages with WPL (Windows Personal Librarian) in 1988. Last summer PLS released Document Manager System, a package for in-house use that marries its full-text search tools with ocr and document imaging. The DMS program competes with similar recently introduced comprehensive page-image-plus-text document-management packages from full-text competitors such as ZyLab, Executive Technologies and a growing number of document imaging vendors.

Personal Librarian, in its dos, Windows, Mac, Unix and vms flavors, is designed to manage large libraries of text documents, such as those on cd-rom, for information dissemination or for internal use. Personal Librarian can link fielded and unstructured information and images to documents. It supports hyperlinks between documents, and it enables full-text search of conventional kinds.

Added value: concept search. The real power of Personal Librarian, however, is its ability to help the user find as quickly and as accurately as possible the documents in a database that are most relevant to a given search interest. The basic problem that Personal Librarian addresses is the classic "You don't know what you are missing," the notorious failure of conventional Boolean full-text search methods to retrieve most of the documents, in a collection of periodical articles or resumes, for example, that are really relevant to a searcher's intent.

There is growing academic literature on the subject of developing "smart search" procedures and a number of approaches and variations on approaches under way. Already noted, SmarTrieve, Compton's NewMedia product, combines several methods, including one based on a semantic network, a super thesaurus that tries to map how terms are conceptually related to one another in hierarchies of relationships. Search Express, from Executive Technologies, relies on manual weighting of the importance

of each of as many as 15 search terms by the searcher, a simple, but potentially effective, approach to going beyond Boolean and, or, not logic.

Derived from software that was known as SIRE, Personal Librarian does not require a predeveloped thesaurus or semantic network, or manual weightings. Rather, it uses statistics derived from the full-text index itself: how often terms occur and co-occur in the library of documents, and how closely (with what proximity) they do so. Some of the techniques are these:

1. Weight rare terms in a search query more heavily than words or phrases with a high frequency of occurrence in the database.
2. Weight co-occurrence of two different search terms in the same document more heavily than the occurrence of only one.
3. Weight the co-occurrence of search terms in close proximity of one another more highly than if they are far apart in the document.
4. To expand a search to a broader "conceptual" level, list for the user words that the Personal Librarian discovers to have a pattern of association with the user's requested word(s) and ask which words should be added to the search list. Alternatively, broaden the search by automatically adding all of the new-found words to the search query.
5. Still another technique is to have the user select the most relevant documents or paragraphs from those initially identified, and then to let the software extract words from them to use as query terms for further searching. Each successive search produces a relevancy-ranked group of documents screened by procedures such as #1, #2 and #3.

Cd-rom titles published with Personal Librarian Software include the Library of Congress American Memories Collection, the ABC News Disc (a listing of available news footage), the U.S. Code (published by the House of Representatives), NIH grant applications, the EPA Risk Assessment Library, the Financial Times, The Economist, and technical documentation for companies such as Bull, Unisys and ICL.

Summary. This full-text search program provides a statistical approach to concept searching and relevance ranking that can efficiently find relevant documents or paragraphs when standard Boolean queries are ineffective.

TextWare Corporation: TextWare

TextWare, founded in 1989, is headquartered in Park City, Utah. Privately held, it has ten employees.

TextWare is a full-text indexing and retrieval package with a pcx image viewer. TextWare is often used on magnetic hard disk drives as a text database manager for individuals or workgroups, but it is also a cd-rom authoring tool.

TextWare uses a card file metaphor to describe collections of documents. A "card" in a TextWare CardFile can be a paragraph, a page, an entire document, or a database record with defined fields. Each card is given a 68-character (maximum) header that labels it in search hit lists.

Both indexing and retrieval portions of the package are available for dos and Macintosh System 7. Pulldown menus, dialog boxes and mouse support are available in the character-based dos user interface; the Mac version utilizes a familiar Mac graphical user interface.

Example customers include the Federal Deposit Insurance Corporation, which uses TextWare to publish quarterly bank performance reports on cd-rom. Quanta Press, one of the cd-rom publishing pioneers, has authored titles with TextWare ranging from the About Cows disc to the CIA World Factbook on Cd-rom. Also published as TextWare CardFiles are Wayzata Technology's Place-Name Index on Cd-rom and Disc to the Future, a collection of more than 200 megabytes of programs and utilities for Mac programmers.

The TextWare Retrieve Only software can be included on Mac and dos cd-rom discs. A royalty-free retrieval module, TextWare Lite, is available for dos only. (A Mac version is expected in the second half of this year.) TextWare Lite contains a subset of TextWare Retrieve Only features -- the Lite program cannot access or search across multiple CardFiles simultaneously and can only output blocked text to disk or printer.

Files converted to TextWare's "ascii-like" format can be compressed to

about 50% of their original size. TextWare indexes usually are only 10-20% of the size of the original text files.

Image support. Images in other than the pcx format, plus multimedia data of all kinds, can be viewed by automatic spawning of the appropriate external viewer or player program. Image files, but not specific points in the pictures, can be linked to text. WordPerfect and Word files with graphics can be imported, preserving the links between text and graphics. Files from these two word processors can be indexed without conversion.

Indexing/searching. Fielded records are imported into templates and users can search across one or more fields. Fielded data searches are limited to simple word searches, with wildcards.

Full-text searches are aided by a word wheel. A search dictionary, sticky notes and bookmarks are also available. Boolean, phrase, proximity and wildcard searches are supported. Boolean operators that TextWare recognizes are and, or, xor, not, andnot and ornot. Proximity can be specified to reflect order and closeness.

Searches yield a hit list of cards that contain either the search criteria or synonyms. Users can jump to the cards, which display the found search words in highlighted form. They can scroll through a card's text or jump to another card on the hit list. With TextWare Retrieve Only, blocked text, individual cards or all cards on the hit list can be ouput to disk, printer or memory clipboard.

No non-English retrieval shells are available off the shelf, but a TextWare Toolkit enables a programmer to attach a custom user interface to TextWare's C-language subroutines.

Many common word processing formats can be imported into TextWare. Automated file conversions are supported, including indexing parameters, but a markup langage for manually preparing files is also provided. Text formatting, including bold and underline attributes, can be retained. Text links can be defined between one or more words and another word, several words in sequence, one or more images, another executable program, a sticky note or a bookmark.

Cards can be linked to one another in a CardFile to form groups, which can include up to 8,000 cards. A group could be a sequence of cards making up a section of a book, for example, or it could be a logical grouping of paragraphs relating to a particular topic, dispersed throughout the CardFile or document database.

The CardFile structure and TextWare's unique search capabilities make it a cd-rom authoring package to consider for a variety of text database types.

TMS: InnerView

Founded in 1981, TMS is one of the pioneers of electronic publishing technology. TMS demonstrated the use of optical discs for text databases ten years ago, developed one of the first hypertext implementations and played an important role in the specification of the High Sierra/iso 9660 cd-rom formatting standard. TMS also developed one of the first all-software image compression/decompression toolkits, which it licenses widely to the electronic publishing and document image processing industries.

The TMS InnerView product family integrates image display, hyperlinks and full-text searching. As expected from its heritage, page image display and navigation from compressed raster-scanned documents is supported more fully than in most competing packages.

InnerView can manage the content of many books on one cd-rom. It has been customized for Pratt & Whitney jet engine maintenance documentation, General Dynamics technical support system (with engineering drawings up to H size), Price Waterhouse laptop cd-rom resource and lan-access cd-rom tax reference database. Arthur Andersen uses InnerView to publish more than 100 reference books on cd-rom for its field auditors. NILS uses InnerView to prepare insurance law and regulation databases on all 50 states for cd-rom distribution to the insurance industry.

One authoring/multiple retrieval packages. The InnerView authoring module is called InnerView Database Preparation Software. The retrieval software can be InnerView Retrieval Software, for Windows and Macintosh, or

it can be the simpler QuickView package for Windows. A software toolkit, MasterView, allows developers to integrate full-text search, imaging or hypertext into Windows applications.

InnerView directly supports numerous compressed and uncompressed image file formats (8-bit color and gray scale scheduled for the second quarter). It supports the font and text attribute features of the native operating environments. Files in sgml and rtf format can be imported. The logical structure of a document can constrain searches, as defined by the author during design. Hyperlinks, set up to navigate from the table of contents, are also used to display annotations, bookmarks, text and image cross-references and a search audit trail.

Full-text indexed pages can look like pages, except that images linked to the pages are stored and displayed in a separate window. Text and graphics windows can be displayed simultaneously. Audio and motion video can be "spawned" via external viewers. Text compression is optional. Encryption and password protection may be provided. Users can mark text for printing or saving to disk. They may also output the current page, document, search results list or audit trail.

Up to 256 text fields may be set up, typically to facilitate-locating text material. Text (the full text minus a modifiable stop list) is searched by single word, phrase, Boolean operators, proximity or wildcard. It may also be conducted against a hit list defined by earlier search terms. Any or all of the books in the information database can be searched . The ranking of documents in the hit list can be by number of hits or by location in the database. All hyperlinks, predefined by the author , include text-to-text, text-to-image, image-to-image and image-to-text functions. Text fields can be searched, both within and across fields, but range searching and reporting based on the fielded data are not supported.

Of the two Windows retrieval shells, InnerView Retrieval uses the standard Windows interface, while QuickView uses buttons. Non-English interfaces are supported, and customization of the user interface can be accomplished with the MasterView toolkit or with programming services from TMS.

Summary. InnerView has most of the text and image retrieval tools one could ask for, except for sophisticated concept searching. It also can display the documents in ways that more closely resemble printed pages than much of the competition. In a new version of Innerview for Windows that is being released in the near future, the effort that has gone into designing the user interface for the retrieval software has now been expended in the case of the authoring tool, which is still rare in the industry. The easy-to-use authoring software will be called TMS Publisher (see photo). TMS Publisher, expected to be shipped early in the second quarter of 1993, will also add text conversion utilities for converting common word processing files to sgml, whence it can be converted to the InnerView format.

Voyager: Expanded Book Toolkit

Voyager's Expanded Book Toolkit and the retrieval software Voyager calls The Library, combined with HyperCard, present an approach to electronic publishing on and for the Macintosh that explicitly builds from the book and page model, expanding it, as the name implies, in useful directions by incorporating text search, hyperlink and multimedia features. Output is designed for the screen, rather than for printing.

Voyager was founded in 1985. Its first products were the Criterion Collection videodiscs that transfer important films to a video format with great care and impressive technical quality, often accomplishing what amounts to a restoration in the process. Criterion videodiscs also add supplementary audio or video material about the film and its creation. Beyond the Criterion movies, Voyager publishes pioneering multimedia videodisc and computer software titles on topics such as music, art, history, current events and travel.

Just as the Criterion Collection raised movies for video players to the level of a new art form, the Expanded Books series attempts the same for electronic books. Expanded Books are book titles distributed on digital

media (floppy disks, with the first cd-rom titles expected soon), designed with the Macintosh PowerBook as the intended delivery platform.

The emphasis is on using electronic techniques such as full-text indexing, hyperlinks, audio and graphics to enhance the book format, while retaining as many features of printed books as possible. Such features include: full typographic richness of a printed page, ways that readers mark and annotate conventional books, such as writing or drawing lines in the margins, highlighting, inserting bookmarks, turning down page corners, etc. The PowerBook made it possible not only to mimic the printed page, but for the entire delivery platform to approach the portability of an ink-on-paper volume.

The Expanded Book Toolkit is the software that Voyager developed to prepare its own HyperCard-based Expanded Book titles. Voyager is now trying to leverage its software development by licensing a toolkit to other publishers.

Toolkit features. The data that appear on the disc are in HyperCard stacks. Character sets supported by HyperCard are displayable, along with QuickTime audio and video, CD-Audio, and aiff and "snd" audio resources. Graphics are stored as pict files.

The authoring process supported by the Voyager Expanded Book Toolkit involves importing text chapter by chapter from word processing files, adjusting the appearance of pages and correcting errors, attaching annotations, and, in the case of cd-rom, submitting a disk for premastering.

Text searches use HyperCard's "find" functions, finding next or previous occurrences of any word, a list of pages on which the word appears, and a list of the word in context. Multiple-word searches can be conducted, yielding a list of pages on which the words appear together. "Find" lists can be saved for later retrieval.

HyperLinks both within a book and between books are supported, creating interesting possibilities for multiple-book cd-roms. HyperLinks can join text to text, pictures, Macintosh audio, cd-audio, videodisc or QuickTime. They also can spawn another application via a HyperTalk "do" statement.

Authors create the links manually. Users can save their find lists and can electronically turn down page corners, apply paper clips, write black lines in the margin, write notes in a notebook and write in the margin of the page. A large-print feature can change the print size.

The 31 available Voyager Expanded Books titles were published on floppy disk. The firm is now planning its first cd-rom titles.

Summary. Voyager's approach to portable electronic books focuses on the user interface of the retrieval package, which is designed to mimic electronically with an Apple PowerBook the experience of reading a printed book. The software still has a unique feel to it, although other products for Mac and Windows are evolving toward similar approaches. As a floppy-based product, the user-annotation features are less cumbersome to implement than with a read-only cd-rom as the distribution disc.

ZyLab Division of IDI: ZyIndex

ZyLab claims that ZyIndex, created in 1983, was the first pc-based text retrieval software package. ZyIndex for dos and Windows are indeed well known. ZyLab says that 100 clients have used ZyIndex to index cd-rom and worm databases.

ZyImage is a new document imaging package that automatically indexes scanned pages by first translating the captured images into machine-readable characters via ocr (optical character recognition) and then applying ZyIndex full-text indexing software to the resulting text files.

Either ZyIndex or ZyImage can be used as cd-rom authoring tools.

The ZyLab products do not compete as multimedia authoring systems, but rather as document managers. One significant advantage of the ZyLab packages is their capability to index, read and display documents in their native file formats. Page breaks and line breaks are preserved, but font and character attribute codes are ignored. Graphics can be linked or embedded in the pages for viewing or printing. Not as optimized for cd-rom

as some software, the ZyLab products' performance on cd-rom can be improved by downloading the indexes and retrieval software to the hard disk. The space needed for the index will be about 35% of the size of the text files, or potentially as much as 200 megabytes per cd-rom disc.

The ZyIndex full-text search software supports full-text indexing, modifications by the author to the stop list, multiple document search, proximity search, Boolean search and scrollable vocabulary windows. A thesaurus can be used to broaden a search. A form of concept searching is also supported.

Text-to-text, graphics-to-text, graphics-to-graphics, bookmarks and notes links may be defined, preindexed or generated on the fly. ZyImage automatically links text to graphic files such as scanned images of pages. Section headers are marked up in the source document and displayed by ZyIndex. ZyLab promises sgml markup will be supported in late 1993.

Fields may be defined and searched, including by range. A report can be generated showing kwic, keyword in context, for all the documents that are "hits" by the search criteria. Graphics can be zoomed, rotated, enlarged, scrolled and stretched. Hyperlinks are even supported from specific locations in a graphics file.

A ZyIndex or ZyImage database is constructed by telling ZyIndex where the documents are located. ZyIndex reads the file and builds the index automatically. The files can reside in multiple locations and be pulled together for later compilation on the final submission medium for premastering.

Indexing speed was benchmarked by ZyLab at 20 mb per hour on a '486 pc. ZyIndex supports simultaneous dos and Windows front ends to the same set of data and index.

Summary. The typical use of ZyIndex and ZyImage is in-house archival of text documents and the creation of online manuals. The software is not well optimized for cd-rom, but it is inexpensive.

SPECIAL FEATURES: illustration; table; chart
COMPANY NAMES: Tribune Co. Compton's NewMedia--Products; Crowninshield Software Inc.--Products; Dataware Technologies Inc.--Products; Executive Technologies Inc.--Products; Folio Corp.--Products; Knowledge Access International Inc.--Products; KnowledgeSet Corp.--Products; MicroRetrieval Corp.--Products; Nimbus Information Systems Inc.--Products ; Ntergaid Inc.--Products; Online Computer Systems Inc.--Products; Personal Library Software Inc.--Products; TextWare Corp.--Products; TMS Inc. (Stillwater, Oklahoma)--Products; Voyager Co.--Products; Zylab Inc. --Products
DESCRIPTORS: CD-ROM; Software Design; Authoring Languages; Application Development Software; Search Software
SIC CODES: 7372 Prepackaged software; 7371 Computer programming services; 7375 Information retrieval services
TRADE NAMES: SmarTrieve (Search software)--Design and construction; MediaBase (Search software)--Design and construction; MediaBase Windows (Search software)--Design and construction; CD Answer (Search software)--Design and construction; CD Author (Data conversion software)--Design and construction; CD Author HyperText Development System (Data conversion software)--Design and construction; CD Answer HyperText (Search software) --Design and construction; Full Text Build (Program development software) --Design and construction; Text ReferenceBook (Search software)--Design and construction; Record ReferenceBook (Program development software)-- Design and construction; Search Express (Search software)--Design and construction; Folio Views 2.1 (Search software)--Design and construction; KAware Disk Publisher (Text processing software)--Design and construction ; Desktop Dataprep (Program development software)--Design and construction; Knowledge Retrieval System (Database access software)-- Design and construction; re:Search (Search software)--Design and construction; Romware (Program development software)--Design and construction; HyperWriter (Program development software)--Design and construction; HyperReader (Search software)--Design and construction;